

**Informing the development of a new model of care to
improve the fertility-awareness of sub-fertile women in
primary health care**

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DEDICATION

This thesis is dedicated to my grandmothers Eileen and Daphne, mother Joan, and daughter
Alex.

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THESIS DECLARATION

I hereby declare that this thesis contains no material which has been accepted for the award of any other degree or diploma at any university or equivalent institution and that, to the best of my knowledge and belief, this thesis contains no material previously published or written by another person, except where due reference is made in the text of the thesis.

Signed:

Date:

This research was approved by the Monash University Human Research Ethics Committee (MUHREC). The project numbers and approval dates are as follows: CF07/2800 – 2007001718 granted on the 4TH of December 2007, CF08/2008 – 2008000979 granted on the 15th of December 2008, and CF11/2246 – 2011001268 granted on the 11th of August 2011.

ABSTRACT

Infertility is an important health issue in Australia affecting one in six couples. Increasingly these couples are being referred from general practice to assisted reproductive technology clinics for tertiary level care. Whilst there is general agreement that some infertility can be prevented by addressing modifiable lifestyles and other risk factors, limited research has examined women's understanding of the fertile period of the menstrual cycle as a possible risk factor for infertility.

The aim of this study was to inform the development of a new model care to improve the fertility-awareness of sub-fertile women in primary health care. It was hypothesised that most women who are seeking assisted reproductive technology treatment cannot correctly identify the fertile window of the menstrual cycle, and whilst most general practitioners and practice nurses do not provide fertility-awareness education because of a lack of education and training, practice nurses will show greater interest than general practitioners in delivering fertility-awareness education for sub-fertile women.

The study used a mixed methods design and had two phases. Phase 1 measured fertility-awareness knowledge, attitudes and practices of women attending general practice ($n = 328$) and infertile women on admission to assisted reproductive technology clinics ($n = 204$). Phase 2 entailed three stages, and included a review of guidelines concerning their recommendations on fertility-awareness education in the primary care of infertile women, measured fertility-awareness knowledge, attitudes and practices of general practitioners' ($n = 278$) and practice nurses' ($n = 473$) when women first report trouble conceiving, and interviews with general practitioners ($n = 11$) and focus groups with practice nurses ($n = 20$) exploring the barriers and enablers, if any, and how best to deliver FA education in general practice.

The study found that few women attending general practice (2.1%) and assisted reproductive technology clinics (12.7%) correctly identify the fertile period of the menstrual cycle. Conversely, a high degree of agreement exists between these women groups (92.2% and 94.5%, respectively) and general practitioners' and practice nurses' (89.2%) that women should receive fertility-awareness education when first reporting trouble conceiving. These findings strengthen the research evidence that poor fertility-awareness is a modifiable risk factor for infertility, and suggest that general practice is an appropriate setting for an intervention promoting couples' fertile potential through a better understanding of the fertile time of the menstrual cycle. There was general agreement among general practitioners and practice nurses that greater use of specially trained nurses and midwives in a collaborative team care arrangement with general practitioners would improve both the quality and accessibility of fertility-awareness education in general practice. The study also identified that patient educational materials are needed to guide the delivery of fertility-awareness education in general practice.

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ABBREVIATIONS

ABS	Australian Bureau of Statistics
APNA	Australian Practice Nurses Association
ART	Assisted reproductive technology
BEACH	Bettering the Evaluation and Care of Health
BBT	Basal body temperature
IUI	Intrauterine insemination
FA	Fertility-awareness
GP	General Practitioner
HWA	Health Workforce Australia
ICSI	Intracytoplasmic sperm injection
IVF	In vitro fertilisation
LH	Luteinizing hormone
MBS	Medical Benefits Scheme
MUHREC	Monash University Human Research Ethics Committee
MRC	Medical Research Council
NHS	National Health Service
NFP	Natural family planning
PBS	Pharmaceutical Benefits Scheme
PHC	Primary health care
PN	Practice Nurse
RCT	Randomised control trial
RACGP	Royal Australian College of General Practitioners
RCNA	Royal College of Nursing, Australia
WHO	World Health Organization

CHAPTER ONE: INTRODUCTION

1.1 Personal Introduction

Ideas for health research commonly emerge from clinical practice (Medical Research Council, 2008). With a nursing career that has spanned three decades in sexual and reproductive health, I have frequently observed how little knowledge women have of fertility-awareness (FA) and that a lack of this knowledge appears to be strongly associated with both unplanned pregnancy and infertility. These observations in clinical practice initiated my interest to undertake this research.

In Australia, one in six couples experience infertility at some point in their reproductive life-time (Loxton & Lucke, 2009) and just over half of all women report an unplanned or mistimed pregnancy (Read, Bateson, Weisberg, & Estoesta, 2009). Despite these high rates of infertility and unplanned, as well as the associated increases in morbidity and mortality for both mothers and babies in these situations (Levi, Simmonds, & Taylor, 2009; Wade, Herrman, & McBeth-Snyder, 2012), remarkably little research has explored the possible link between women's knowledge of FA and their agency to achieve and avoid pregnancy (Frank-Herrmann, Gnoth, Baur, Strowitzki, & Freundl, 2005), and none has ever been undertaken in Australia.

The possibility of one day undertaking a study such as this was first considered whilst reading an article entitled 'Fertility awareness in women attending a fertility clinic' (Blake, Smith, Bargiacchi, France, & Gudex, 1997). In that study, 80 infertile women who were seeking assisted fertility treatment at a New Zealand assisted reproductive technology (ART) clinic were surveyed for their knowledge of FA. Whilst all of the respondents had been trying to conceive for two years or more, only 26 per cent correctly identified the fertile window of the menstrual cycle. The authors concluded

that women's poor knowledge of FA may be a contributing cause of infertility (Blake et al., 1997). As a result, they went on to establish a FA education service within the ART clinic. However, this innovation was disassembled within a year of being initiated as a result of the attrition of skilled staff that provided the education and the reluctance of the medical staff to fund the education (personal communication, Deborah Blake, 2007).

The New Zealand story is a cautionary tale with salutary lessons for researchers who aim for change in health care – for change to be successfully implemented and sustained into the future, it is crucial that barriers are identified and targeted by interventions aimed specifically at overcoming them (Straus, Tetroe, & Graham, 2010). For this reason this study used a mixed methods design informed by the complex intervention framework to improve health care – (Medical Research Council, 2008). The complex intervention framework was specifically chosen as the conceptual framework for this study because it provides step-by-step guidance on the development, evaluation and implementation of complex interventions to improve health care (Campbell, 2007; Medical Research Council, 2008). This type of study design it is more likely to lead to knowledge translation and improved health care that is sustained into the future (Medical Research Council, 2008), as the conclusions are drawn from the combined findings of the various investigations involving the key stakeholders (Cooper, Porter, & Endacott, 2010; Duffy, 1987; Medical Research Council, 2008).

Australia (Australian Women's Health Network, 2012), like other similar countries including the United States (Macaluso et al., 2010), does not have a national plan to reduce infertility in primary health care (PHC). Nor does Australia have a comprehensive sexual and reproductive health strategy (Commonwealth of Australia, 2010; Ford, Nassar, Sullivan, Chambers, & Lancaster, 2003; O'Rourke, 2008) in which such a plan could form a component (Australian Women's Health Network, 2012; Ford et al., 2003). Many researchers have lamented this shortcoming in Australian public health policy (Australian Women's Health Network, 2012; Loxton & Lucke, 2009; Taft et al., 2011). This study is in response to this known fact, and also the result of witnessing over many years the hardship

many infertile couples endure –seemingly needlessly – because of a lack of basic knowledge regarding reproduction.

The focus of this study is women’s FA knowledge, attitudes and practices as a modifiable risk factor for infertility. This risk factor for infertility was specifically chosen, as it remains largely unaddressed (Dunson, Colombo, & Baird, 2002; Stanford, Mikolajczyk, Lynch, & Simonsen, 2010) and has not been explored in the Australian setting. There is an extensive literature on other modifiable lifestyle risk factors for infertility that should be addressed in PHC, such as being overweight or obese and smoking (Haywood, 2009; Macaluso et al., 2010). These risk factors are being addressed by a newly formed Australian organisation called the ‘Fertility Coalition’. The Fertility Coalition is a joint project of the Victorian Assisted Reproductive Treatment Authority (VARTA), the Robinson Institute, Andrology Australia and the Jean Hailes Foundation (The Fertility Coalition, 2012). The aim of the coalition is to conduct a public information campaign called ‘Your Fertility’ about lifestyle factors that affect men’s and women’s fertility (The Fertility Coalition, 2012). This study will add to and complement the work of the Fertility Coalition by filling a gap in our current knowledge about the relationship between women’s knowledge of FA and their agency to achieve pregnancy.

This study focuses on infertility in the light of the Australian Government’s health system reforms promoting prevention in health care through improved health literacy in new models of care (Australian Government Department of Health and Ageing, 2010). The relationship between women’s knowledge of FA and unplanned pregnancy is addressed only briefly as it relates to the topic of infertility.

Australian data have been reported at all times where possible throughout this thesis. Data from other countries have been included where necessary to either supplement Australian data or to illustrate Australia’s position in relation to international trends on the study topic.

By describing the relationship between women's knowledge of FA and their agency to achieve pregnancy, it is anticipated that this study will inform the development of a new model of care to reduce infertility by promoting women's understanding of the time in the menstrual cycle they can conceive. It is also anticipated that this study will make a contribution towards the development of Australia's first national comprehensive sexual and reproductive health strategy in which reducing infertility by expanding preventive activities is a priority area for action (Australian Women's Health Network, 2012).

1.2 The Study Plan

1.2.1 Research Statement

Previous research has suggested that women's poor understanding of FA may be a contributing cause of infertility (Blake et al., 1997). Although correctly timed intercourse within the fertile window of the menstrual cycle may shorten time to pregnancy (Brosens et al., 2004; Colombo & Masarotto, 2000; Colombo, Mion, Passarin, & Scarpa, 2006; Frank-Herrmann et al., 2005; Wilcox, Weinberg, & Baird, 1995) helping some couples to avoid ART treatment (Gnoth et al., 2005; Stanford, White, & Hatasaka, 2002), an intervention to improve FA education in general practice for couples who report trouble conceiving has not been developed.

1.2.2 Study Rational

Increasingly, over the last few decades couples who report trouble conceiving to their GP are less likely to be treated in general practice (Britt & Miller, 2009) and more likely to be referred on to ART clinics for tertiary level care (Britt & Miller, 2009; Britt et al., 2011; Wang, Macaldowie, Hayward, Chambers, & Sullivan, 2011). The rising trend in increased use of ART treatment in Australia is financially unsustainable for Australia's health system (Anderson, Nisenblat, & Norman, 2010).

Assisted reproductive technology is expensive (Chambers, Ho, & Sullivan, 2006; Sullivan, Wang, Chapman, & Chambers, 2008) and associated with increases in morbidity and mortality for both mothers and babies (Davies et al., 2012; Hansen, Bower, Milne, de Klerk, & Kurinczuk, 2005; Reddy, Wapner, Redbar, & Tasca, 2007; Reefhuis et al., 2009b). In addition, not all couples who are having trouble conceiving can access ART treatment or wish to use ART treatment for religious, personal and financial reasons (ESHRE Capri Workshop Group, 2004), and concern has been raised about the extension of ART treatment to treat all virtually diagnostic categories of sub-fertility, which may be contributing to both to the over use and unnecessary use of ART treatment (Eijkemans et al., 2008; Kamphuis et al., 2014).

The Australian Government is currently reforming Australia's health system to emphasise health promotion and disease prevention. They are doing this through the development of comprehensive PHC services in new models of care in general practice (Australian Government Department of Health and Ageing, 2010).

1.2.3 Aims and Objectives

This study aimed to inform the development of a new model of care to improve the FA of sub-fertile women when first presenting in general practice with trouble conceiving by:

1. Measuring FA knowledge, attitudes and practices of infertile women on admission to ART clinics and women attending general practice;
2. Conducting a comprehensive review of current national and international PHC guidelines for their recommendations concerning FA education in infertile people;
3. Measuring FA knowledge, attitudes and practice of GPs and PNs when women first present in general practice with trouble conceiving, and;
4. Exploring GP's and PN's views on the barriers and enablers, if any, to the provision of FA education in general practice, and how best to deliver this.

1.2.4 Overview of the Thesis

Following on from this introductory chapter, Chapter Two presents the literature review, which has framed and informed this study. Four different, yet interconnecting, discourses have been drawn upon to provide the necessary background. These being; a review of current trends in infertility and the associated increases in use of assisted conception treatment over the past few decades, the national and international policies and documents guiding the implementation PHC in Australia, and the arguments for and against FA education in the initial care and treatment of infertile people.

Chapter Three describes the two phase mixed methods design of the study. Both quantitative and qualitative approaches investigate several levels of health care in relation to FA and infertility, being perspectives from women, PHC practitioners and guideline recommendations.

Chapter Four presents the results of Phase 1 and Phase 2 of the study.

Chapter Five discusses the findings of the study in relation to the literature review, then compares and contrasts these findings in an analytical process called triangulation to determine where they are convergent, complementary or different. The conclusions of this analytical process are then synthesised to inform a new model of care to improve the delivery of FA education in general practice.

Chapter Six summarises the study, drawing together the conclusions from the combined findings of Phase 1 and Phase 2. The significance of the study and potential recommendations for practice are stated, study limitations and strengths are described, and future research is listed.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

Australia's health system is currently undergoing reform to emphasise health promotion and disease prevention through improved health literacy in new models of care. Currently, there is no model of care in general practice supporting the delivery of FA education as one way of reducing infertility in women who report trouble conceiving. This chapter reviews the current literature and discourse on infertility in relation to this study. It highlights current trends focusing on the gaps in women's knowledge and lifestyles that may influence their ability to conceive (see 2.2). The limitations of current medical management of infertile people is critically evaluated with a focus on health equity and the high costs and increases in morbidity and mortality for both mothers and babies associated with ART treatment (see 2.3). National and international policies and reports are drawn upon to identify the critical elements of PHC models of care (see 2.4). The arguments for and against FA education in the initial assessment and treatment of infertile women in general practice are presented (see 2.5). Electronic data bases were searched using EBM reviews, EMBASE, Ovid Medline, PubMed, Scopus, and Cochrane library. Automatic downloads were received through to April 2014, as articles in the above fields of research became available. In addition, electronic searches of national clearing houses, guideline development organisations, and professional organisations were conducted. The four areas of research reviewed in this study are set out below.

2.2 The Clinical Definition of the Term ‘Infertile’

In discussing infertility it is important to establish the definition that underpins and has framed the research undertaken in this study. The clinical definition of ‘infertile’ is classically defined as when a couple fails to conceive after having regular unprotected intercourse for 12 months or more (Hunault et al., 2004; Stanford, Thurman, & Lemaire, 1999; te Velde, Eijkemans, & Habbema, 2000; van der Steeg et al., 2005). This definition is based on an historical study that examined time to pregnancy in 5,574 women over 12 months of unprotected intercourse; 85 per cent had conceived at 12 months and the remaining 15 per cent conceived naturally over the next 10 years (Poppe, Velkeniers, & Glinooer, 2008). The classical definition of ‘infertile’ is utilised by the WHO (The World Health Organization, 2002a) and is generally accepted in Australian general practice (Ford et al., 2003).

2.2.1 Utility and Limitations of the Clinical Definition ‘Infertile’

The utility of this definition is that it indicates the earliest time at which fertility investigations generally become appropriate to exclude the need for treatment; it does not necessarily indicate sterility (Blake et al., 1997; Poppe et al., 2008). There are other definitions of the term ‘infertile’, such as when a couple fails to conceive after having regular unprotected intercourse for two years or more (Gurunath, Pandian, Anderson, & Bhattacharya, 2011; The World Health Organization, 2011b). However, they have not been widely adopted in clinical practice, as they do not have the same utilitarian application as the classical definition does (Habbema et al., 2004; Poppe et al., 2008). For the purposes of consistency throughout this thesis, the classical definition of ‘infertile’ has been used unless otherwise stated.

It is important to note that until there is agreement about the criteria used for making a diagnosis of ‘infertility’, it will be difficult to accurately estimate the true prevalence, either within or between specific populations (Boivin, Bunting, Collins, & Nygren, 2007), or indeed evaluate the effectiveness of interventions (Gurunath et al., 2011). This is a problematic situation for demographers and

clinicians (Gurunath et al., 2011; Habbema et al., 2004) and also for researchers (Habbema et al., 2004). In addition, it is generally recognised that the meaning of the term ‘infertile’ can be confusing and misleading for both clinicians and patients alike (Gnoth et al., 2005; Gurunath et al., 2011; Habbema et al., 2004). These are important points, which are returned to at different times throughout this thesis. Below, the different diagnostic categories of infertile are presented in detail.

2.2.2 Diagnostic Categories of Infertility

The term ‘infertile’ can be divided into a number of different diagnostic categories. An accurate understanding of these different categories is crucial to estimating a couples chances of conceiving either naturally or with a particular intervention (Eijkemans et al., 2008).

First, a couple can have either primary infertility or secondary infertility. Primary infertility is the inability to conceive a first pregnancy within 12 months of trying, and secondary infertility is the inability to conceive a second or subsequent pregnancy also within 12 months of trying (Quinn, 2005; Templeton, Fraser, & Thompson, 1991).

Second, a couple can be either sub-fertile or sterile. Most couples who are diagnosed as being ‘infertile’ are actually sub-fertile (Blake et al., 1997; Gnoth et al., 2005). The term ‘sub-fertile’ is used to indicate that fertility is reduced by a known or unknown cause (Jansen, 2003). Whilst sub-fertile couples may conceive naturally, this possibility is a reduced possibility (Blake et al., 1997; Eijkemans et al., 2008; Stanford et al., 1999; te Velde et al., 2000). In contrast, ‘sterile’ is the complete biological inability to conceive (Eijkemans et al., 2008; Jansen, 2003). The causes of sterility are few (Blake et al., 1997), including azoospermia (Kim, Kim, & Paick, 1999), complete ovarian failure and bilateral fallopian tube blockage (Eijkemans et al., 2008; Jansen, 2003). Few couples (only 1-5%) who are diagnosed as being infertile are sterile with no chance of conceiving naturally (Dunson, Baird, & Colombo, 2004; Gnoth et al., 2005; Habbema et al., 2004).

The diagnostic category of ‘sub-fertility’ can be divided into either ‘unexplained infertility’ and ‘relative infertility’ (Jansen, 2003). The term ‘unexplained infertility’ is applied when the cause is unknown to indicate that a couple’s fertility tests show nothing is biologically wrong, but conception is failing to occur (Jansen, 2003). The term ‘relative infertility’ is applied when the cause or causes have been identified, such as a medical condition (for example, polycystic ovarian syndrome (PCOS) and endometriosis) (Stanford et al., 1999), or a lifestyle factor (for example, obesity or smoking) (Anderson, Nisenblat, et al., 2010; National Institute for Clinical Excellence, 2004).

The distinction between infertility and sub-fertility is central to this thesis, as only sub-fertility is potentially amenable to an intervention in general practice. Given that most couples who experience trouble conceiving are sub-fertile, not biologically infertile (Dunson et al., 2004; Gnoth et al., 2005; Habbema et al., 2004), an intervention in general practice promoting couples’ fertile potential could help many couples to conceive. What is currently known about the main contributing causes of sub-fertility in Australia is presented below.

2.2.3 Incidence of Infertility in Australia

Infertility is an important health issue in Australia affecting one in six couples (Loxton & Lucke, 2009). The overall incidence of infertility in Australia (Wilkes, Chinn, Murdoch, & Rubin, 2009) and the main contributing causes (Wang et al., 2011) are similar to those reported in other industrialised countries (Haywood, 2009; National Institute for Clinical Excellence, 2004; Poppe et al., 2008). Australian data have shown that female fertility factors account for around 34.6 per cent of couples inability to conceive, male factors for 20.7 per cent, combined male and female factors for 12.0 per cent, and unexplained for 27.6 per cent (Wang et al., 2011).

2.2.4 Current Trends in Infertility in Australia

It is important to note that while the causes of infertility may vary between populations and change over time in the same populations, age specific rates of infertility have remained relatively stable (Boivin et al., 2007; Chandra & Stephen, 1998). Contrary to popular belief, the overall incidence of infertility worldwide has also remained fairly constant over the last few decades (Boivin et al., 2007; Mascarenhas, Flaxman, Boerma, Vanderpoel, & Stevens, 2012; Poppe et al., 2008).

2.2.4.1 Delayed Childbearing

The single most significant cause of infertility in industrialised countries in recent decades is the sociological trend towards later childbearing when fecundability (the probability of conceiving in a menstrual cycle with unprotected intercourse) (Habbema et al., 2004) is naturally reduced (Australian Bureau of Statistics, 2008a; Chandra & Stephen, 1998). It is generally accepted that a woman's chances of conceiving naturally declines markedly after age 35 years (Haywood, 2009; National Institute for Clinical Excellence, 2004). More recently it has been shown that male fertility also declines with age from the mid 30s onwards (Dunson et al., 2004; Dunson et al., 2002; ESHRE Capri Workshop Group, 2005).

However, despite the fact that age 35 years is generally accepted as border-line in terms of female fertility (Maheshwari, Hamilton, & Bhattacharya, 2008), limited data are available on the actual rate of decline and on the factors from the biological to the social contributing to the decline (National Institute for Clinical Excellence, 2004; Rosina & Rizzi, 2006; Tingen, Stanford, & Dunson, 2004). Best estimates until recently were based on the success rates of IUI with donor sperm, highlighting an obvious limitation of the data (National Institute for Clinical Excellence, 2004).

Delayed childbearing in Australia is demonstrated with just 27 per cent of women having their first child before the age of 30 in 2006 compared with 92 per cent in 1976 (Clark & Mackenzie, 2007). In

2006 the median maternal age of mothers (the age below which 50% of women give birth) was 30.8 years compared with 25.4 years 1971. Although the rise in median maternal age appears to have halted and stabilised in recent years (being slightly lower at 30.6 years in 2009) it still remains relatively high (Australian Bureau of Statistics, 2009). Australian Bureau of Statistics (ABS) data have shown that delayed childbearing reduces women's total fertility rate (TFR) and increases the risk of involuntary childlessness (Australian Bureau of Statistics, 2008a). In just four decades, involuntary childlessness at 40 to 44 years of age has doubled from eight per cent of women born between 1937 and 1941 to 16 per cent of women who were born between 1962 and 1966 (Australian Bureau of Statistics, 2008a).

Lampic et al. (2006) surveyed 222 young Swedish female university students and found that they plan to have children even later than in previous generations (Lampic, Svanberg, Karlstrom, & Tyden, 2006). The impact of delayed childbearing on fecundability appears not to be fully appreciated by women. This was demonstrated in *The Australian National Fertility Study (2006)*, which surveyed 2400 men and women aged 18 years and older and found that 43 per cent of childless female respondents aged 40 to 49 years believed that they would be able to conceive when they wanted to (Clark & Mackenzie, 2007). A more recent Australian study of 462 men and women aged 18 to 45 years of age has shown that most women fail to appreciate the true decline that occurs in fertility with increasing age by around 10 years (Hammarberg et al., 2013).

Delayed childbearing has occurred at a time when a greater number of ART clinics are available (Chandra & Stephen, 1998; National Institute for Clinical Excellence, 2004; Wang et al., 2011), and also when it is more acceptable to seek help at ART clinics (National Institute for Clinical Excellence, 2004). Over 50 per cent of women seeking assisted conception at ART clinics in Australia are aged 35 years and older (Hammarberg & Clark, 2005; Wang et al., 2011). These women are also more likely to be nulliparous, well educated, married, and wealthier (Davies et al., 2012; McDowell & Murray, 2011; Stewart et al., 2012).

2.2.4.2 Lifestyle Risk Factors for Infertility

In addition to delayed childbearing, a number of common poor lifestyles are known contributing causes of infertility (Anderson, Nisenblat, et al., 2010; Anderson, Norman, & Middleton, 2010; Chavarro, Rich-Edwards, Rosner, & Willett, 2007; ESHRE Task Force on Ethics Law et al., 2010; Homan, Davies, & Norman, 2007).

Several studies have shown relatively high rates of poor lifestyles among Australian men and women of reproductive age. *The Australian National Fertility Study (2006)* found that one in three men and women of reproductive age have a lifestyle risk factor that would impact their fertility, such as smoking, increased weight, excess caffeine, and alcohol consumption (Clark & Mackenzie, 2007). The *Men in Australia Telephone Survey (MATeS) (2005)* of 5990 men between the ages of 40 and 69 years found that one in three have one or more common reproductive health problems, including erectile dysfunction, largely the result of poor lifestyles (Holden et al., 2005). The findings of these studies are concordant with Australian general practice activity data, which have shown that 61.8 per cent of adults were either overweight or obese, 14.8 per cent smoked daily, or 24.8 per cent drank alcohol at at-risk levels (Britt et al., 2011).

Obesity as a risk factor for infertility deserves special attention in this thesis as the prevalence in Australia is rising, especially among young women (Commonwealth of Australia, 2010). Obesity increases with increasing distance from major Australian cities (Women's Health Australia, 2011). A recent study of a rural Australian town found that 65.6 per cent of women of reproductive age were either overweight or obese (Cunningham & Teale, 2013). People who live in regional and rural and remote areas of Australia have poorer health and also lower access to health care services (Health Workforce Australia, 2012a). Overall, rural populations have shown 24 per cent higher rates of smoking, 32 per cent higher rates of risky alcohol consumption and 15 per cent higher rates of overweight and obesity (Health Workforce Australia, 2012a). The *Australian Longitudinal Study on*

Women's Health (ALSWH) has shown that infertile women who were daily smokers or obese were less likely to medical seek advice (Loxton & Lucke, 2009).

A recent Australian study of 462 men and women aged between 18 and 45 years found that whilst 59 per cent were aware that smoking and obesity impact female fertility, only 30 per cent were aware that these lifestyles also impact male fertility (Hammarberg et al., 2013). The same poor lifestyles that increase risk for infertility (Britt & Miller, 2009; Clark & Mackenzie, 2007) increase risk for chronic disease (for example, cardiovascular disease, cancer and diabetes) (The World Health Organization, 2002b, 2011a), and may also reduce the effectiveness of ART treatment (ESHRE Task Force on Ethics Law et al., 2010; Grainger & Frazer, 2006; Homan et al., 2007; Leridon, 2004; The Practice Committee of the American Society for Reproductive Medicine, 2012). In addition, poor lifestyles in expectant parents and can have long term health consequences for their children (Anderson, Nisenblat, et al., 2010).

2.2.4.3 Lifestyle Risk Factors and Ovulatory Dysfunction

One way in which poor lifestyles contribute to female factor fertility problems is by causing ovulatory dysfunction (Chavarro et al., 2007; Haywood, 2009). Ovulatory dysfunction increases with advanced maternal age (ESHRE Capri Workshop Group, 2005). A main feature of ovulatory dysfunction is altered timing of ovulation and, therefore, the fertile period of the menstrual cycle (Haywood, 2009; Homan et al., 2007). Around a third (34.6%) of couples who seek assisted conception treatment at ART clinics have a female factor fertility problem (Wang, et al., 2011), and ovulatory dysfunction is a major contributing cause accounting for 18 to 30 per cent (Chavarro et al., 2007).

Advanced maternal age (ESHRE Capri Workshop Group, 2005) and poor lifestyles (Chavarro et al., 2007; Haywood, 2009) are well recognised causes of ovulatory dysfunction. Despite this, women's knowledge of the fertile period of the menstrual cycle is not generally recognised as a risk factor for

infertility (National Institute for Clinical Excellence, 2004; Snick, 2005). This possible risk factor for infertility is, therefore, not included in this section of the literature review. The literature search on FA methods and women's understanding of the fertile period of the menstrual cycle is presented in part four of this review (see 2.5).

This part of the review has identified current trends and what is known about modifiable risk factors for infertility. It has shown that most people who experience trouble conceiving are sub-fertile, not sterile, mainly the result of delayed childbearing and poor lifestyles. Whilst ovulatory dysfunction is associated with delayed childbearing and poor lifestyles, women's understanding of the fertile period of the menstrual cycle is not generally recognised as a risk factor for infertility. In the next part of the review, the use of ART treatment as the principle treatment option across virtually all diagnostic categories of infertility is critically evaluated.

2.3 Definition of 'Assisted Reproductive Technology' (ART)

Assisted reproductive technology is a rapidly evolving area of reproductive medicine (Finnström et al., 2011). Consequently, the glossary of ART terminology has recently been revised (Zegers-Hochschild et al., 2009). Assisted reproductive technology is now defined as any fertility treatment in which both eggs and sperm are handled outside the human body. This includes, but is not limited to, in vitro fertilization (IVF), intracytoplasmic sperm injection (ICSI), embryo donation, and gestational surrogacy. Less invasive procedures, such as intrauterine insemination (IUI) of husband or donor sperm (Zegers-Hochschild et al., 2009) and ovarian stimulation medication (specifically, Clomiphene citrate) (The World Health Organization, 2002a) are not included in this new definition. In vitro fertilization is defined as a procedure in which ovum is fertilised by sperm in a plastic dish (extra corporeal fertilisation) and intracytoplasmic sperm injection is a variation of IVF in which a single

sperm is injected into the inner cellular structure of an egg (Zegers-Hochschild et al., 2009). In vitro fertilization is the most commonly performed ART procedure in Australia and the number of ICSI procedures performed is rising rapidly (Wang et al., 2011).

All ART procedures performed in Australia and in New Zealand are reported annually by the Australian Institute of Health and Welfare (Wang et al., 2011). In 2009, a total of 70,541 ART treatment cycles were performed. Of those procedures, IVF accounted for around two-thirds and ICSI around one-third (Wang et al., 2011).

2.3.1 Governance and Safety Concerns About ART Services

Macaluso et al. (2010) has expressed concern that an international evaluation of ART services concluded that the industry is largely unregulated, and that no comprehensive systems exist for determining the impact from the biomedical to the social of ART treatments (Macaluso et al., 2010). Caplan & Patrizio (2010) have raised similar concerns arguing that ART treatment should be considered human experimentation but without the practitioners being held to the standard ethical requirements governing clinical research (Caplan & Patrizio, 2010). In essence, these authors contend that ART practice has effectively been left to the market place and is without clear international guidance (Caplan & Patrizio, 2010; Macaluso et al., 2010).

2.3.2 The Rising Trend in Increased Use of ART Treatment

Notwithstanding these concerns regarding ART treatment, people have increasingly turned to ART treatment to overcome their fertility problem (de Graaff, Land, Kessels, & Evers, 2011; Leridon & Slama, 2008; The World Health Organization, 2002a). Around 78 per cent of the world's population now live in countries that have ART clinics providing assisted fertility services (ESHRE Capri Workshop Group, 2001). Yet, despite this, the European Society of Human Reproduction and

Embryology (ESHRE) has argued that there are sufficient ART clinics available worldwide for less than one third of those in need (ESHRE Capri Workshop Group, 2001).

In Australia, growth of the ART services industry has been exponential. In 1980 when Australia's first (and the world's second) IVF baby was born, there were only four operating ART clinics in Australia (Herbert, Lucke, & Dobson, 2009a). In a little over three decades the number of ART clinics operating in Australia has grown to 77 (Wang et al., 2011). The use of ART treatment in Australia has accelerated in recent years (Wang et al., 2011); between 2004 and 2008 the number of procedures performed increased on average by more than 10 per cent per year (Wang et al., 2011).

The proportion of children born from ART treatment is expected to continue to rise (Andersen & Erb, 2005) as the number of available ART clinics around the world continues to increase (Salleh, 2008). In 2011 an estimated 4.3 million children had been born from ART treatment worldwide (Wang et al., 2011). Around one in every 35 (3.2%) babies is born in Australia is from ART treatment (Wang et al., 2011). In some Nordic countries the figure is much higher where around one in every 20 (3.9%) babies is born from ART treatment. Denmark is the only country with a national reporting system of all assisted conception treatment; and there, around one in 16 (6.2%) babies is born from ART treatment (Andersen & Erb, 2005). If the less invasive assisted fertility treatments (including, IUI of husband or donor sperm procedures and Clomiphene citrate) were included in the Australian and New Zealand annual ART report (Wang et al., 2011), the number of babies born from assisted conception treatment in Australia and New Zealand would be much higher than is currently reported.

2.3.3 The Evidence of ART Treatment

Despite the worldwide trend in increased use of ART treatment (de Graaff et al., 2011; Leridon & Slama, 2008; Wang et al., 2011), properly designed clinical trials have not been undertaken to compare either the success of ART treatment or the cost of ART treatment per live birth against

expectant management and other alternative treatment options (Eijkemans et al., 2008; Stanford, Parnell, & Boyle, 2008).

In vitro fertilization was initially developed to treat women with bilateral tubal occlusion (a cause of sterility with no chance of spontaneous conception) (Kamphuis et al., 2014; Zegers-Hochschild et al., 2009). Only for this condition, and to a lesser extent severe male sub-fertility, is there sufficient evidence to recommend IVF and ICSI as the most effective treatment options (Bouwman, Grijseels, Braat, Evers, & Hemrika, 2002; Eijkemans et al., 2008; Kamphuis et al., 2014). Despite this, the use of ART treatment has been extended to include virtually all diagnostic categories of infertility, even though benefit over alternative management options has not been demonstrated (Bouwman et al., 2002; Eijkemans et al., 2008; Kamphuis et al., 2014).

The extension of ART to treat virtually all diagnostic categories of sub-fertility is non-evidence based (Kamphuis et al., 2014), and may be contributing to both the substantial overuse and unnecessary use of ART treatment (Eijkemans et al., 2008; Kamphuis et al., 2014). This situation is both ethically and morally problematic given the intrusive nature of ART treatment, and the higher overall health care costs and increases in risks for mothers and babies associated with ART treatment (ESHRE Task Force on Ethics Law et al., 2010; Kamphuis et al., 2014).

2.3.4 Health Inequities Associated with ART Treatment

Despite the large and growing number of available ART clinics in Australia providing assisted fertility services (Wang et al., 2011), the *Australian Longitudinal Study on Women's Health (ALSWH)* has shown that among women who reported infertility, two thirds sought advice but only half used ART treatment (Loxton & Lucke, 2009). This report reveals that most Australian women who have reported trouble conceiving either chose not to use ART treatment or could not use ART treatment.

Although ART services have become a generally accepted part of health systems (Caplan & Patrizio, 2010; Kerin, 2010; National Institute for Clinical Excellence, 2004), the geographic location of ART clinics (ESHRE Task Force on Ethics Law, 2009; Ombet, Cooke, Dyer, Serour, & Devroey, 2008; Serour, 2002), and the high costs of ART treatment are critical barriers to accessing ART treatment (Bunting & Boivin, 2007; ESHRE Capri Workshop Group, 2004). Most ART clinics are located in larger cities (Wang et al., 2011) and are predominantly privately owned and operated (Australian Women's Health Network, 2012; Caplan & Patrizio, 2010; Ratcliffe, 1992; Trumble, 2005). These barriers especially affect people who live outside major cities (Australian Women's Health Network, 2012).

In addition to these barriers to accessing ART treatment, there is a substantial literature documenting reasons for rejecting ART treatment and discontinuing ART treatment before achieving a live baby. The reasons for rejecting ART treatment can be divided into three discrete categories; medical, psychosocial, and ethnic and religious factors. Medical factors included fear of the actual procedures (for example, hormonal injections and ovum aspiration), fear of side-effects (for example, hyperstimulation, multiple pregnancies, malformations and premature birth), a lack of confidence in a successful outcome (for example, female age, duration of infertility, and history of unsuccessful infertility treatments). Psychosocial factors included conflict between work and time-consuming treatment regimens, mental stress as a result of treatment and the anticipation of an unsuccessful outcome. Ethnic and religious factors included rejection of ART because of strict beliefs against the use of such treatment. Opposing family and social attitudes can also play a role (ESHRE Capri Workshop Group, 2004).

In addition, the discontinuation rates of ART treatment before achieving a live birth have remained relatively high – at around 25 to 33 per cent (Luke et al., 2012; Macaldowie, Wang, Chambers, & Sullivan, 2013). Drop-out rates well above 50 per cent have been reported in some studies (Sharma, Allgar, & Rajkhowa, 2002; Verberg et al., 2008). This phenomenon occurs across all stages of the

treatment plan; before treatment starts, during actual treatment, and after one or more unsuccessful treatment cycles (Brandes et al., 2009; Luke et al., 2012; Malcolm & Cumming, 2004; McCusker, 1982; Smeenk, Verhaak, Stolwijk, Kremer, & Braat, 2004). The most common reasons cited for discontinuing ART treatment included the burden of the treatment regimen (Verberg et al., 2008), cost of the treatment (McDowell & Murray, 2011), lack of success and psychological stress (McDowell & Murray, 2011; Olivius, Friden, Borg, & Bergh, 2004; Rajkhowa, McConnell, & Thomas, 2006), poor prognosis, having discovered the reason for infertility, coming to terms with being infertile (ESHRE Capri Workshop Group, 2004; Olivius et al., 2004), and spontaneous conception (Brandes et al., 2009; Olivius et al., 2004). The relatively high rates of spontaneous conception following a diagnosis of infertility is worthy of specific attention in this thesis and is, therefore, discussed below.

2.3.5 Spontaneous Conception Rates Following a Diagnosis of Infertility

A number of studies have reported on spontaneous conception rates following a diagnosis of infertility without fertility treatment of any type while waiting to commence ART treatment, between ART treatment cycles, and even after ART treatment has been discontinued (Bhattacharya et al., 2008; Brandes et al., 2009; Eijkemans et al., 2008; Ratcliffe, 1992). This phenomenon was first reported more than three decades ago (Gnoth et al., 2005; McCusker, 1982) not long after ART treatment was first initiated in the 1970s in Australia (Herbert et al., 2009a).

According to the most recent Australian data on the topic, 43.8 per cent of 7,000 Australian women aged 28 to 36 years who reported difficulty conceiving for at least one year, subsequently gave birth to a live baby without undergoing fertility treatment of any type (Herbert, Lucke, & Dobson, 2012). Nine per cent of women across a number of different diagnostic categories of infertility who were registered for assisted conception treatment at a clinic in the Netherlands spontaneously conceived before starting therapy, and 19 per cent delivered live births from spontaneously conceived pregnancies mostly after the start of ART treatment, but not as a result of the treatment (Eijkemans et

al., 2008). Sixty-nine per cent of couples who had been given a diagnoses of unexplained infertility spontaneously conceived over 36 months without having fertility treatment of any type (ESHRE Capri Workshop Group, 2004). Seventy-two per cent of 342 sub-fertile couples in the Netherlands had given birth at 36 months without fertility treatment of any type (Snick, Snick, Evers, & Collins, 1997). Three per cent of 120 men who had been treated with ICSI for severe oligozoospermia had a subsequent pregnancy without treatment, and 11.5 per cent of 200 couples four years after one to four failed ICSI treatment cycles had a live birth without any further treatment (ESHRE Capri Workshop Group, 2004).

2.3.6 The Success and Cost of ART Treatment

Although the overall success of ART treatment has improved with time, Australian data have shown that it still remains low with only 17.2 per cent of reported IVF cycles resulting in the birth of a live baby (Wang et al., 2011). This means that multiple treatment cycles (an average of 5 treatment cycles) are usually needed before a live birth is achieved from ART treatment (Wang et al., 2011). In Australia, less than 15 per cent of couples who are undergoing ART treatment have five more IVF cycles because of the increasing dropout rate following each failed attempt (Macaldowie et al., 2013).

When estimating the cost per live birth from ART treatments in Australia, only the direct medical costs of the treatment are calculated (Chambers et al., 2006). A typical IVF cycle in Australia costs around \$6940.00 (Chambers et al., 2006). The chance of a live birth per non-donor IVF cycle was around 25 per cent for women younger than 35 years, 18 per cent for women 35 to 39 years, 6 per cent for women aged 40 to 44, and less than one per cent for women aged 44 years and over (Wang et al., 2011). Based on these age related success rates, the average cost per live birth was around \$25,000.00 for women 35 years and younger, \$500,000.00 for women between 36 to 44 years (Chambers et al., 2006), and \$1 million for women 45 years and older (Sullivan et al., 2008).

The costs of ART treatment to consumers are only partially funded under the Medicare Safety Net payments and, therefore, the out of pocket expenses are considerable (Anderson, Nisenblat, et al., 2010). In 2009, accessibility was further reduced when a political decision was made to reduce the Medicare Safety Net payment (Medicare Australia, 2009) to contain the rising cost of ART treatment and maintain the overall sustainability of Australia's health system (Anderson, Nisenblat, et al., 2010). Similar decisions have been made elsewhere. For example, in the United Kingdom one Primary Care Trusts (PCT) suspended all access to IVF because of depleted resources (Zorlu, 2010), Denmark has removed ART treatment from the free public health services list and substantially restricted the criteria for government reimbursement (Shaikh, 2010a), and Canada recently reversed a past decision to increase funding for ART treatment (Shaikh, 2010b).

In addition to the high cost of ART treatment, babies conceived from ART treatment are associated with higher overall health care costs as a result higher rates of monitoring and intervention during pregnancy, birth by caesarean section, and hospitalisation in the post-natal period (Chambers, Grayson, Shanahan, & Sullivan, 2007; Hansen et al., 2008; Reddy et al., 2007). Children conceived from ART treatment compared with those conceived naturally are more often admitted to hospital and spend significantly more days in hospital up to seven years of age (Koivurova, Hartikainen, Gissler, Hemminki, & Jarvelin, 2007).

2.3.7 Increases in Risks in Mothers Associated with ART treatment

Maternal morbidity and mortality is higher being associated with increases in rates of preeclampsia, placental abruption, post-partum haemorrhage (Källén, Finnström, Nygren, Otterblad Olausson, & Wennerholm, 2005), ovarian hyper stimulation, multiple gestation (Grainger & Frazer, 2006), placenta previa, and gestational diabetes (Reddy et al., 2007). Caesarean section rates are higher following ART conceptions (Davies et al., 2012; Reddy et al., 2007). Higher caesarean section rates is associated with poorer maternal and infant outcomes for current and future births (Einarsdóttir et al.,

2012), being linked with a 50 per cent increased risk for placenta previa, a 40 per cent increased risk for placental abruption in future pregnancies (Yang et al., 2007) and an increased risk for intrauterine foetal death in the subsequent pregnancy (OR = 2.6; CI 1.1-6.2) (Osborne, Ecker, Gauvreau, & Lieberman, 2012). More than 90 per cent of first caesareans lead to repeat procedures in subsequent pregnancies (Spong, Berghella, Wenstrom, Mercer, & Saade, 2012). The risk for venous thrombosis is higher throughout the entire pregnancy; 4.2 per 1000 women ($n = 99$) after IVF compared with 2.5 per 1000 ($n = 291$) in women with natural pregnancies (Henriksson et al., 2013). In the extreme, complications associated with ART treatment can be fatal for mothers and babies (Grainger & Frazer, 2006; Schutte, Schuitemaker, & Steegers, 2008).

Early parenting difficulties and post-natal mood disturbance has been found to be 1.7 times higher following ART conceptions compared with natural conceptions (Fisher & Hammarberg, 2005).

The possibility that IVF might be associated with an increased risk for gynaecological cancers remains an open question. In a large Australian study, the first of its kind, Venn et al. (1999) found no overall increased incidence of gynaecological cancers at one and 22 years following the use of fertility drugs (Venn, Watson, Bruinsma, Giles, & Healy, 1999). However, more recent studies have shown that there was an overall increased risk for ovarian cancers associated with IVF treatment (Källén et al., 2011; van Leeuwen et al., 2011). The risk for borderline ovarian tumours was significantly increased, nearly double that found in sub-fertile women not treated with IVF. No increased risk was found for invasive ovarian tumours (van Leeuwen et al., 2011). Whilst no association was found with Clomiphene citrate with short-term use and ovarian neoplasm – removed from the glossary of ART terminology in 2009 (Zegers-Hochschild et al., 2009) – use greater than 12 ovulatory cycles was associated with an increased risk of developing an ovarian neoplasm (The World Health Organization, 2002a).

Only a few studies have investigated a possible link between IVF treatment and a woman's risk of developing breast cancer (Stewart et al., 2012). A large Australian study with a longer follow-up period than most and stratified for age, found that while, overall, IVF was not associated with an increased risk for breast cancer, women who underwent IVF at a younger age (20 to 24 years of age) were at increased risk of breast cancer (1.56; 95% CI 1.01-2.40) (Stewart et al., 2012). Overall, the findings of these studies suggest that more long term research is needed before women can be advised with any degree of certainty whether they have an increased risk for gynaecological cancers following assisted conception treatment with IVF or with Clomiphene citrate.

2.3.8 Increases in Risks in Babies Conceived from ART treatment

Infant morbidity and mortality is higher following ART conceptions being associated with increases in rates of multiple pregnancy (Australian Bureau of Statistics, 2001), foetal growth restriction (Grainger & Frazer, 2006), low birth weight (Cohen et al., 2009), preterm birth (birth before 37 weeks) (Institute of Medicine of the National Academies, 2006), congenital and chromosomal abnormalities, risks associated with increased maternal complications (Reddy et al., 2007), and overall increased risk of birth defects (Darine et al., 2009). Preterm birth was significantly associated with increased risk of psychiatric hospitalisation in adulthood (Nosarti et al., 2012). A 2014 Australian study, the largest of its kind in the world, found that singleton assisted conception compared with spontaneous conceptions were more likely to be stillborn (OR = 1.82, 95% Confidence Interval (CI) 1.34–2.48), and that survivors were more likely to be disadvantaged by lower birth weight (2109 g, CI 2129–289), very low birth weight (OR = 2.74, CI 2.19–3.43), very preterm birth (OR = 2.30, CI 1.82–2.90) and neonatal death (OR = 2.04, CI 1.27–3.26) (Marino et al., 2014).

Hansen et al. (2002) compared the overall risk of birth defects for children who were conceived from IVF ($n = 837$) or ICSI ($n = 301$) with children who were conceived naturally ($n = 4000$); 75 conceived with IVF (9.0%) and 26 infants conceived from ICSI (8.6%) had a major birth defect diagnosed by

one year of age, compared with 168 who were conceived naturally (4.2%; $P < 0.001$) (Hansen, Kurinczuk, Bower, & Webb, 2002). A later study by Hansen et al. (2005) involving a systematic review and meta-analysis of 25 studies concluded that there was an overall 30 to 40 per cent increased risk of birth defects among children who were conceived from ART (Hansen et al., 2005). A United States population-based multi-centre case controlled study of birth defects concluded that babies who were conceived from ART were 2.4 to 4.5 times more likely to have a birth defect; septal heart defects were two times more common, cleft lip and/or cleft palate 2.4 times more common, oesophageal atresia 4.5 times more common, and anorectal atresia 3.7 times more common (Reefhuis et al., 2009a). Around 25 to 30 per cent of ART-conceived children have displayed generalized vascular dysfunction, which may have consequences for their long-term health (Scherrer et al., 2012). Relatively rare congenital syndromes, including Beckwith-Wiedemann Syndrome (Niemitz & Feinberg, 2004), Angelman and Prader-Willi syndromes (Grainger & Frazer, 2006), and Russell-Silver dwarfism (Reddy et al., 2007) were more common in these children. However, the rarity of these syndromes makes a causal relationship difficult to establish (Grainger & Frazer, 2006). Congenital anomalies are a major reason for hospitalisation in infancy and childhood, and a significant cause of disabilities and disease burden for children up to age 14 years (Abeywardana, Karim, Grayson, & Sullivan, 2007; Abeywardana & Sullivan, 2008). Compared with naturally conceived children, children conceived from ART treatment are more often admitted to hospital and spend significantly more days in hospital up to seven years of age (Koivurova et al., 2007).

The possibility that ICSI might spread genetic or epigenetic defects remains controversial. This procedure is mostly used to treat sub-fertile males (National Institute for Clinical Excellence, 2004). A main concern is that it might pass male factor fertility problems on to male offspring (Grainger & Frazer, 2006). This procedure is being increasingly performed in Australia (Wang et al., 2011). Seminal research has found that ICSI-conceived babies were twice as likely to have a major birth defect and 50 per cent more likely to have a minor defect (Kurinczuk & Bower, 1997). More recent

studies have supported an association between birth defects and ICSI treatment (Davies et al., 2012; Hansen et al., 2005; Hansen et al., 2002; Reefhuis et al., 2009b).

In relation to childhood cancers, Kallen and colleagues (2010) have compared cancer rates in 26,692 children conceived from IVF with a control group of 2.4 million children who were not conceived from IVF, and found that IVF was associated with a moderately increased risk of developing a cancer of the blood, eye, central nervous system and some solid cancers; the total cancer risk estimate was 1.42 (95% confidence interval: 1.09-1.87) higher in childhood (Källén et al., 2010).

Although the research evidence has suggested that babies conceived from ART treatment have higher risk for birth defects, the reasons for this excess in risk remains unclear. Reddy et al. (2007) hypothesised that there were three possible causes, including: (i) the ART treatment, (ii) pharmacologic agents used in ART treatments, and (iii) underlying cause(s) of infertility (Reddy et al., 2007). More recently Davies et al. (2012) have shown that when prenatal factors such as smoking during pregnancy, medical conditions and history of infertility were accounted for, the risk for birth defects associated with IVF, but not ICSI, were attenuated (Davies et al., 2012).

Understanding all known and possible risks associated with ART treatment for both mothers and babies is considered critical for people considering ART treatment to give informed consent. Informed consent to ART treatment is a quality and safety issue in the care of infertile people.

2.3.9 Quality of Informed Consent to ART Treatment

Informed consent to medical procedures is a safety and quality issue in health care (Australian Commission on Safety and Quality in Health Care, 2012). The World Health Organization (WHO) (The World Health Organization, 1994, p. 10) defines informed consent as:

Patients have a right to be fully informed about their health status, including the medical facts about their condition; about the proposed medical procedures, together with the potential risks

and benefits of each procedure; about alternatives to the procedures, including the effect of non-treatment; and about the diagnosis, prognosis and progress of treatment..

There is general agreement that all infertile couples who are considering ART treatment should be informed of all known and possible risks to themselves and their baby (Mourad et al., 2009; Reddy et al., 2007; Reefhuis et al., 2009b), the probability of achieving pregnancy with the treatment (Grainger & Frazer, 2006) and of all alternative treatment options (National Health and Medical Research Council, 2004 (revised, 2007)). No Australian study was found in this review on informed consent to ART treatment. However, a study of 1499 patient couples at 16 Dutch IVF clinics in the Netherlands found that in most cases the quality of informed consent to ART procedures was poor and in need of improvement. Only 14 per cent had received information on the risks of an IVF/ICSI treatment prior to commencement of the treatment, and less than half (46%) received lifestyle advice such as weight loss that would improve the chance of natural conception as an alternative option to ART treatment (Mourad et al., 2009).

Although ART treatment has become the most preferred option for the treatment of infertility (Eijkemans et al., 2008; Kamphuis, 2014), ART treatment is intrusive, associated with higher overall health care costs and increases in morbidity and mortality for both mothers and babies (Kamphuis et al., 2014). The extension of ART treatment to include virtually all diagnostic categories of sub-fertility is not evidence based, and may be contributing to both the overuse and unnecessary use of ART treatment (Kamphuis et al., 2014). In addition, not all people who report trouble conceiving can access ART treatment or want to use ART treatment (ESHRE Capri Workshop Group, 2004). This critique of ART treatment and current trends in increased use of ART treatment underscores the importance of developing interventions to reduce infertility in primary care. In the next part of the review, the aims and philosophy of PHC are drawn upon to help conceptualise an intervention to reduce infertility in the initial assessment and treatment of infertile people in general practice.

2.4 The Arguments for Primary Health Care (PHC)

There is general agreement between the Australian Government (Australian Government Department of Health and Ageing, 2009, 2010) and peak medical (Bennett, 2009) and nursing organisations (Australian Practice Nurses Association, 2011; Royal College Nursing Australia, 2009) that Australia's health system is fragmented, inequitable and unsustainable, and poorly equipped to meet the current and future health care needs of Australians. To produce a better equipped and more responsive health system to meet the current and future needs of Australians, Australia, like Canada and New Zealand, now considers a PHC focus essential (Australian Government Department of Health and Ageing, 2009; The World Health Organization, 2008). The aims and philosophy of PHC were first set out in the *Declaration of Alma-Ata (USSR, 1978)* (The World Health Organization, 1978), which is summarised below.

2.4.1 Aims and Philosophy of PHC

The *Declaration of Alma-Ata (USSR, 1978)* is described as a landmark document in the global development of PHC (Chiarella, 2008). It was initiated by the WHO and United Nations Children's Fund (UNICEF) to address the need for urgent action by all governments, health and development workers, and the world community to protect and promote the health of all people (The World Health Organization, 1978). Essentially, the declaration aimed for political change in health care by redefining health as a state of complete physical, mental and social well-being (not only the absence of disease) and by placing health within the social determinants of peoples' lives for which everyone, including governments, communities, and individual people should take responsibility and play a role (Tejada de Rivero, 2003; The World Health Organization, 2008). In essence, the declaration explicitly promotes a rights-based approach to health care for all that is both acceptable and accessible within their community (The World Health Organization, 2007). The WHO (The World Health Organization, 1978, p. 1) defines PHC as follows:

Primary health care is essential health care based on practical, scientifically sound and socially acceptable methods and technology made universally accessible to individuals and families in the community through their full participation and at a cost that the community and country can afford to maintain at every stage of their development in the spirit of self reliance and self-determination. It forms an integral part both of the country's health system, of which it is the central function and main focus, and of the overall social and economic development of the community. It is the first level of contact of individuals, the family and community with the national health system bringing health care as close as possible to where people live and work, and constitutes the first element of a continuing health care process.

Australia is a Member State of the WHO (The World Health Organization, 2012f) and is, therefore, a signatory to the *Declaration of Alma-Ata (USSR, 1978)* (The World Health Organization, 1999) and to a number of other international treaties promoting a rights-based approach to health care (Australian Women's Health Network, 2012).

While in principle the *Declaration of Alma-Ata (USSR, 1978)* is generally accepted worldwide, actual implementation of PHC has been slow (The World Health Organization, 2008). In recognition of this fact, in 2008 the WHO renewed its commitment to PHC with a focus on addressing three current trends: (i) health systems that focus disproportionately on specialised curative care; (ii) a focus on short-term health results that is fragmenting health systems; and (iii) a casual approach to governance that has allowed unregulated commercialisation of health services to flourish (The World Health Organization, 2008).

There is strong research evidence that the commercialisation of health care can lead to fragmentation of care, overspecialisation and emphasis on expensive technology (Relman, 2012; The World Health Organization, 2008). Studies have consistently shown that a disproportionate focus on specialist and hospital-based care provides poor value for money, is associated with higher health care costs in terms of unnecessary medicalisation (Relman, 2012; The World Health Organization, 2008), and increases

in iatrogenic disease (The World Health Organization, 2008). The commercialisation of health also raises the potential for over servicing for financial gain (Relman, 2012; The World Health Organization, 2008). These criticisms have been specifically levelled against the ART industry. (Kamphuis et al., 2014). Unnecessary medicalisation has been shown to waste immense sums of money that could have been used to treat or prevent genuine disease (Moynihan, 2010; Moynihan, Doust, & Henry, 2012; Vitry & Mintzes, 2012).

In contrast, a strengthened PHC system is associated with better overall population health, reduced overall health care costs and greater efficiency within the health systems (Comino et al., 2010; Starfield, 2010). Primary health care is credited with improved health equity, quality of life and social cohesion (The World Health Organization, 2008). It is also seen as a way of containing health care costs and sustaining health systems into the future (Australian Government Department of Health and Ageing, 2009).

2.4.2 Implementing PHC in Australia

To guide the implementation of more effective PHC in Australia, the Australian Government has released a suite of road map documents, which when taken together target all levels of health care to emphasise PHC, from public health promotion, clinical practice through to governance (Australian Government Department of Health and Ageing, 2010). This study draws upon each of these documents with the aim of informing the development of a new model of care to reduce infertility in the initial assessment and treatment of infertile people general practice. The goals of each of these documents are as follows:

1. *Building a 21st Century Primary Care System* nominates four key areas for change – improving access and reducing inequity, better management of chronic conditions, increasing the focus on prevention and improving quality, safety, performance and accountability (Australian Government Department of Health and Ageing, 2010).

2. *A Healthier Future for All Australians* sets out a plan for long-term reform of the whole health system. These reforms place people at the centre of the health system, increase people's participation in their own health care through strengthened PHC services in the community, promote collaborative team care arrangements between health care professionals, and foster continuous improvement in health care practice and health systems (National Health and Hospitals Reform Commission, 2009).
3. *The National Preventive Health Taskforce. Australia: the healthiest country by 2020* aims to promote whole population health by setting targets in some key preventative health activities – overweight and obesity, smoking, harmful drinking, and promoting the life expectancy of Australian Indigenous people (Commonwealth of Australia, 2008).

In addition to these policy documents promoting PHC in general, two other documents specifically promoting women's health through PHC have been published.

1. *The National Women's Health Policy 2010* sets out six key areas for action, two of which are to (1) promote prevention in chronic disease by promoting the health of mothers prior to conception, and (2) sexual and reproductive with a focus on family planning promoting greater reproductive choice and autonomy (Commonwealth of Australia, 2010).
2. *The Women and Sexual and Reproductive Health Position Paper 2012* sets out five key areas for action, including developing women's health literacy, increasing reproductive choice, facilitating women's health throughout pregnancy and birth, and equipping the health workforce to better respond to women's health needs. In this paper, infertility prevention through improved health literacy promoting an understanding of the underlying causes has been nominated as a priority area for action. (Australian Women's Health Network, 2012).

Each of these documents (Australian Women's Health Network, 2012; Commonwealth of Australia, 2008, 2009, 2010; National Health and Hospitals Reform Commission, 2009) emphasise PHC as a

means of promoting health for all regardless of income or geographic location. Primary health care improves coordination and continuity of care and is credited with reducing health inequities, rates of hospitalisation, and reducing rising health care costs (The World Health Organization, 2008). Critical to establishing PHC in Australia is the development of new models of care for service delivery that promote peoples' capacity for self-care (Australian Government Department of Health and Ageing, 2010; Health Workforce Australia, 2012a). A model of care is simply defined as the way in which a particular health care service is delivered (Davidson, Halcomb, Hickman, Phillips, & Graham, 2006).

2.4.3 Models of Care

Models of care promoting PHC are comprehensive, person-centred and promote health literacy (The World Health Organization, 1978, 2008). Davidson (2006) states that new models of care are typically developed in response to a perceived gap between research evidence and clinical practice (Davidson et al., 2006). Following a comprehensive review of the literature, Davidson et al. (2006) concluded that the key elements of a pragmatic model of care included evidence-based practice, quality improvement and collaborative methodology, change management theory, disease management, theoretical perspectives such as self-care theories and consumer participation of identification of needs (Davidson et al., 2006).

Health literacy is defined as the necessary knowledge and skills required to understand and use information relating to disease prevention and staying healthy (Harris et al., 2009). People with limited health literacy have less knowledge of disease and self care, are more frequent users of health services, and have higher rates of hospitalisation and overall health care costs. Health literacy optimises peoples' agency for self care (Harris et al., 2009). Less than half the adult population in Australia have sufficient health literacy to self-manage their conditions and negotiate the health system effectively (Harris et al., 2009).

Several definitions exist for person-centred care (McCormack, McCane, Slater, McArdle, & Dewing, 2008). However, there is general agreement about a number of critical elements, including that it requires the formation of therapeutic relationships between patients and their health practitioners and that these relationships are built on trust, understanding and sharing of collective knowledge (McCormack et al., 2008). Person-centred care is guided by patient's values and is responsive to individual's needs (van Empel et al., 2010). Person-centred care improves quality of care and health outcomes by increasing trust and treatment compliance, increasing patients' uptake of preventive health care activities, improving satisfaction with care, and reducing hospital admissions (The World Health Organization, 2008). Person-centred care is actively promoted by the WHO to optimise family planning decision making and health outcomes (The World Health Organization, 2006), and is valued highly by people who are affected by infertility (Dancet et al., 2010; Wilkes, Hall, Crosland, Murdoch, & Rubin, 2009).

The Australian government has nominated general practice as a key area of change with GPs and PNs as key providers of health promotion and disease prevention to help embed PHC within Australia's health system (Australian Government Department of Health and Ageing, 2010). To facilitate this major change of Australia's health system, Health Workforce Australia (HWA) was established in 2010 (Health Workforce Australia, 2012a).

2.4.4 The Health Care Workforce

Health Workforce Australia (HWA) was established to redress the current and predicted workforce shortages of GPs, nurses and midwives, and to produce the necessary skill mix among these practitioners to meet current and future health care demands (Health Workforce Australia, 2012a).

Workforce modelling by HWA has shown that innovation and reform, and retention of the existing health workforce have the biggest impact on closing the gap between the estimated demand and

supply of GPs, nurses and midwives (Health Workforce Australia, 2012a). Among nurses, workforce retention alone has the biggest impact in closing the gap by 82 per cent for Registered Nurses and 66 per cent for Enrolled Nurses (Health Workforce Australia, 2012a). Factors believed to support the retention of nurses in the health care workforce included the ability to work to their full scope of practice, professional development and career pathways (Health Workforce Australia, 2012a).

Recommendations by HWA for ensuring a sustainable health workforce capable of meeting current and future health care demands included to recruit and retain health practitioners within the health workforce by promoting the development of new models of care delivery, facilitating inter-professional practice, and equipping health professionals and employers to successfully manage current and emerging demands on the health sector (Health Workforce Australia, 2010-11).

2.4.5 General Practice in Australia

General practices in Australia are typically private businesses owned and operated by one or more GPs working within the practice (Watts et al., 2004). The model of practice within these practices is business orientated and based on fee for service (Hoare, Mills, & Francis, 2011; Watts et al., 2004). This is in stark contrast to the PHC model of practice, which is rights-based and person-centred with service provision based on the identified needs of the community (Australian Government Department of Health and Ageing, 2010; The World Health Organization, 1978, 2008).

2.4.5.1 The General Practice Workforce

The Australian GP workforce shortages have in large part been driven by the aging GP workforce population and increasing work load of GPs nationwide. The aging Australian population, rising chronic disease burden, and increases in expectations of health care all add to this problem (Australian Government Department of Health and Ageing, 2009; Halcomb et al., 2005; Health Workforce Australia, 2012a; Watts et al., 2004).

In addition, there is a mal-distribution of the medical workforce in Australia contributing to health inequity between populations. Although populations in regional, rural and remote areas have higher rates of diseases compared with city populations, concentration of the medical workforce is greatest in major cities (Harrison & Britt, 2011; Health Workforce Australia, 2012a). Regional, rural and remote populations also have less access to medical specialists (Health Workforce Australia, 2012a). In contrast, these areas of Australia have higher concentrations of nurses and midwives than doctors (Health Workforce Australia, 2012a).

2.4.5.2 The General Practice Nurse Workforce

The inclusion of nurses in the Australian general practice workforce has occurred only in the last few decades, and has been largely driven by the above GP workforce pressures that are expected to worsen (Britt & Miller, 2009; Watts et al., 2004). As a result, the nursing workforce in general practice is a rapidly growing workforce (Phillips et al., 2009). In just two years between 2005 and 2007, the number of nurses employed in general practice rose by 59 per cent (Australian Practice Nurses Association, 2008). The employment of nurses in general practice is continuing to rise (Australian Medicare Local Alliance, 2012). Practice nurses in Australia, like their counterparts in New Zealand and in the United Kingdom, are typically employed by the GP owner operator of the practice (Hoare et al., 2011).

2.4.5.2.1 Current Qualifications of the General Practice Nurse

Nurses working in general practice are trained to the minimum level of a Registered Nurse or an Enrolled Nurse (Australian Nursing Federation, 2005). A Registered Nurse is a three year degree qualification program (Australian Nursing and Midwifery Accreditation Council (ANMAC), 2012) and an Enrolled Nurse is a two year diploma qualification program (Australian and Nursing Midwifery Council (ANMC), 2009).

The *General Practice Nurse National Survey Report 2012* found that 86.0 per cent of nurses employed in general practice were Registered Nurses (also called Division 1 nurses), 12.6 per cent Enrolled Nurses (also called Division 2 nurses), 10.5 per cent Registered Midwives and 0.3 per cent Nurse Practitioners (Australian Medicare Local Alliance, 2012). Of those, 41.8 per cent reported having attained at least one post-registration qualification and 7.2 per cent were in the process of attaining a post-registration qualification. Post-registration qualifications included endorsed nurse practitioner (0.9%), scheduled medicines endorsement (2.4%), accredited nurse immuniser (35.6%), credentialed diabetes educator (2.0%), credentialed mental health nurse (1.2%), credentialed asthma and respiratory educator (2.6%), and credentialed nurse Pap (Papanicolaou) test provider (15.7%). It is noteworthy that no nurse in this national survey reported a post-registration qualification in family planning (Australian Medicare Local Alliance, 2012).

2.4.5.2.2 Employment and Distribution of the General Practice Nurse Workforce

In 2012, 10,693 nurses were employed in general practice, and 63.3 per cent of practices employed at least one nurse (Australian Medicare Local Alliance, 2012). Most PN's (97.4%) were female (Australian Medicare Local Alliance, 2012). In terms of distribution across Australia, 55.1 per cent of practices in major cities, 83.6 per cent in inner regional Australia, and 86.6 per cent in outer regional, remote or very remote areas employed at least one nurse (Australian Medicare Local Alliance, 2012). However, like the GP workforce (Watts et al., 2004), the PN workforce is an ageing workforce population; 80.9 per cent of Registered Nurses, 81.8 per cent of Enrolled Nurses, and 94.5 per cent of Registered Midwives were aged 40 years or more (Australian Medicare Local Alliance, 2012).

2.4.5.2.3 Initiatives to Increase the Employment of Nurses in General Practices

In 2002, the Australian Government introduced the Practice Nurse Initiative to increase and support the number of nurses employed in general practice (Australian Government Department of Health and Aging, 2012). This initiative included the Practice Incentive Program (PIP), which gave PNs Medical

Benefits Scheme (MBS) item numbers to perform a limited number of specific tasks (Senior, 2008); namely immunisation, wound care, Pap smears, antenatal checks and chronic disease management on behalf of the GP (Australian General Practice Network, 2009). Whilst these item numbers helped to increase the number of nurses employed in general practice (Parker, Walker, & Hegarty, 2010), they have also contributed to limiting their scope practice by focusing their attention on specific tasks that generated income for the practices (Joyce & Piterman, 2009; Keleher, Joyce, Parker, & Piterman, 2007; Parker, Keleher, & Forrest, 2011). Australian general practice data have shown that most nurse encounters with patients involved MBS item numbers (Britt et al., 2010).

To redress this situation and support expanded and enhanced roles for nurses working in general practice, in 2012 the PIP was replaced by the Practice Nurse Incentive Program (PNIP). This replacement program provides new and improved funding arrangements for the employment of nurses in general practice (Department of Health and Ageing, 2012). Three hundred and ninety million dollars have been dedicated to support the employment of an additional 4,600 FTE nurses in general practice (Parker et al., 2011). Eligible practices can receive \$25,000 per annum for employing a Registered Nurse for a minimum of 12 hours and 40 minutes per week and \$12,000 for employing an Enrolled Nurse (Department of Health and Ageing, 2012).

Free from pre-specified income generating tasks, this new funding arrangement was designed to facilitate innovation and increased scope of practice for nurses in general practice to better meet the health care needs of their community (Department of Health and Ageing, 2012). Just over 89 per cent of practices have registered to participate in the PNIP (Australian Medicare Local Alliance, 2012). To assist in educating the Australian community about the availability of nurses and their increasing roles in general practice, the Australian Government has produced a set of posters for display in general practice highlighting some of the key preventive health activities that PNs perform. These include preventive health checks, immunization, and lifestyle management and coordinating care (Department of Health and Ageing, 2012).

2.4.5.2.4 The Contribution of Nurses and Midwives to PHC

The contribution of nurses and midwives to PHC is internationally recognised (Chiarella, 2008). Developing the role of the PN in PHC began in the United Kingdom with a government initiative to instil continual improvement in quality of care in the health system. This was considered necessary to enable general practices to better respond to the health needs of their community and to reduce health inequities (Hoare et al., 2011). In Australia, the role of the PN in PHC is less well established than in the United Kingdom, New Zealand and the United States of America (Joyce & Piterman, 2011; Keleher et al., 2007).

Around 86 per cent of Australians attend general practice each year, highlighting the opportunity for lifestyle interventions in general practice (Commonwealth Department of Health and Aged Care, 2000). However, interventions by GPs promoting prevention in health care remain underutilised (Denney-Wilson et al., 2010). In addition, it has been argued that GPs' alone cannot provide the breadth of care needed by communities and that under-utilization of PNs contributes to health inequity between social groups (Hoare et al., 2011).

Numerous studies have shown that patient education and counselling contribute to lifestyle change for primary prevention of disease and that nurses are effective in the delivery of these interventions (Harris et al., 2009; Sargent, Forrest, & Parker, 2012). Patients have reported that they would be as likely to adopt positive health behaviours whether it was recommended by a PN or a GP, and that they perceive PNs to be more approachable and understanding when discussing lifestyle factors (Mitchell, MacDonald-Wicks, & Capra, 2011). Interventions for primary prevention of disease are especially important in addressing overweight and obesity, smoking, and alcohol consumption (Britt et al., 2010; Royal Australian College of General Practitioners, 2012). Lifestyle interventions help reduce and prevent hospital admissions for a range of conditions (Health Workforce Australia, 2012a).

Over the past decade, nurse-led models of care have been established in a number of clinical fields (Cullum, Spilsbury, & Richardson, 2005). Nurse-led models of care are often developed to improve health outcomes in discrete areas that traditionally are doctor-led (Cullum et al., 2005). While care tasks differ according to the health context, key features of this model is that the nurse is responsible for the overall co-ordination, management and continuity of care (Cullum et al., 2005). Nurse-led models of care in primary care tend to focus on health in the broader sense and have an emphasis on life-management rather than diagnosis and intervention (Britt & Miller, 2009).

Nurse-led models of care have been found to improve health promotion, accessibility, cost effectiveness and patient satisfaction (Chiarella, 2008; The World Health Organization, 2001). A Cochrane review comparing nurse-led care with GP-led care in chronic disease management found that patient satisfaction was higher with nurse-led care (Laurant et al., 2004). In another review comparing nurse-led care with GP-led care in a range of health conditions, nurse-led care was found to improve self-management and health outcomes in a number of different health contexts, including asthma, weight loss and blood pressure control (Hoare et al., 2011). Seminal research has shown that PNs in Australia contribute to improving quality of care in general practice primarily in six ways; as patient carer, organizer, quality controller, problem solver, educator and agent of connectivity (Phillips et al., 2009). The potential of nurses in general practice to improve PHC is internationally recognised (Halcomb, Patterson, & Davidson, 2006). Practice nurses have shown a strong interest professional development for health promotion and prevention of disease (Keleher & Parker, 2013). A strengthened nursing workforce in general practice based on policy development, a framework for education and a career pathway for PNs has the potential to drive change and improve the delivery of many aspects of PHC in Australia (Keleher et al., 2007). Practice nurses believe that role expansion improves the quality of care they deliver and also job satisfaction (Senior, 2008).

Examples of nurse-led and midwife-led care services in Australia that have improved patient outcomes in sexual and reproductive health care include increasing access to sexual health care

(Miles, Knight, Cairo, & King, 2003), improving sexual health self-care in youths (Ingram & Salmon, 2007), increasing cervical screening rates in under screened rural and older women (Cancer Council Australia, 2010) and reducing intervention at birth under case load midwifery care (Tracy et al., 2013).

2.4.5.2.5 Conditions Necessary for Embedding Nurse-Led Models of Care

Several key elements have been identified for successfully embedding nurse-led models of care in general practice. Ehrlich et al. (2013) found that the critical elements for successfully embedding nurse-led care in chronic disease management in general practice were when it fitted with the work of nurses, sufficient time was allocated, considered legitimate by all team members, and improved patient outcomes (Ehrlich, Kendall, & St John, 2013). In another study, Mills et al. (2012) found four key enablers to expanding the role of the PN in the delivery of cervical screening and well women's health care services in general practice; these were a willingness among GPs to relinquish their traditional roles in the provision of these services, a willingness among PNs to expand their scope of practice and take up a role in the delivery of these services, women preferring to see a female health care provider for these services and the presence of a culture that fosters inter-professional teamwork (Mills et al., 2012).

2.4.5.2.6 Barriers to Role Expansion of the Practice Nurse

Despite the proven effectiveness of PNs in promoting prevention in health care, their participation in these activities in general practice has remained low (Britt et al., 2010). The 2011 Bettering Evaluation and Care of Health (BEACH) survey has shown that only 8 per cent of all recorded encounters in preventive health care activities involved a nurse; most were for chronic disease management, few involved sexual and reproductive health care (Britt et al., 2011).

In spite of the Australian Government's initiatives to increase the number of nurses working in general practice (Parker et al., 2010), many real and entrenched barriers limit their ability to contribute to their full potential (Halcomb, Davidson, Salamonsen, Ollerton, & Griffiths, 2008; Joyce & Piterman, 2009; Phillips et al., 2008; Phillips et al., 2009). Identified barriers have included a lack of policy, funding and educational preparation for PNs to deliver services (Australian General Practice Network, 2009; Chiarella, 2008; Halcomb et al., 2008; Joyce & Piterman, 2009; Parker, Keleher, Francis, & Abdulwadud, 2009; Parker et al., 2010; Watts et al., 2004), system barriers preventing nurses from working to their full scope of practice, lack of access to PBS, inadequate remuneration, and lack of access to financial compensation (Australian General Practice Network, 2009; Joyce & Piterman, 2009; Pearce, Hall, & Phillips, 2010; Pearce et al., 2011; Walters et al., 2012). Overcoming the barriers to role development of the PN is considered critical to expanding their scope of practice to better meet the needs of their community (Phillips et al., 2009).

The *General Practice Nurse National Survey Report 2012* has shown that only 52.7 per cent were highly satisfied with the recognition they received for their work, 31.1 per cent with their pay, and 24.1 per cent with their chance of promotion (Australian Medicare Local Alliance, 2012). These high levels of dissatisfaction among PNs all threaten the recruitment and retention of nurses in the general practice workforce (Australian General Practice Network, 2009; Joyce & Piterman, 2009; Phillips et al., 2008; Phillips et al., 2009). The 2013 annual national Salary and Conditions Survey of PNs' found that a strong correlation exists between salary and conditions and 'intention to leave', with 42 per cent of PNs stating that they were either looking for a new position or may look for a new position in the next six months (UltraFeedback, 2014).

The most suitable model of practice for delivering care services by nurses in general practice, therefore, remains a contentious issue (Pearce et al., 2010; Pearce et al., 2011). Currently, there are only two models, the provider substitution model (where the nurse undertakes a delegated subset of GPs' tasks, with no scope of practice outside this subset) and the collaborative practice model (where

the nurse is an autonomous provider of health care working within a defined scope of practice, while also being a member of a multidisciplinary team) (Keleher et al., 2007).

2.4.6 Sexual and Reproductive Health Care in General Practice

In Australia women's sexual and reproductive health is considered a priority health care issue (Australian Women's Health Network, 2012; Commonwealth of Australia, 2010).

The International Conference on Population and Development held in Cairo in 1994 established for the first time a comprehensive framework for considering the range of issues that affect reproductive health. The Cairo conference (Ford et al., 2003, p. 2) concluded that:

...reproductive health therefore implies that people are able to have a satisfying and safe sex life and that they have the capability to reproduce and the freedom to decide if, when and how often to do so. Implicit in this last condition are the rights of men and women to be informed and to have access to safe, effective, affordable and acceptable methods of family planning of their choice, as well as other methods of their choice for regulation of fertility which are not against the law, and the right of access to appropriate healthcare services that will enable women to go safely through pregnancy and childbirth and provide couples with the best chance of having a healthy infant. In line with the above definition of reproductive health, reproductive health care is defined as the constellation of methods, techniques and services that contribute to reproductive health and well being by preventing and solving reproductive health problems.

In essence, the Cairo framework implies that the aim of reproductive health care is to ensure normality during the reproductive phase of life, especially in relation to fertility regulation (Lunenfeld & Insler, 1997). However, like the *Declaration of Alma-Ata (USSR, 1978)* (The World Health Organization, 1978), implementation of the Cairo framework around the world has been slow,

prompting calls for a renewed commitment with a focus on promoting cost effective interventions to improve women's sexual and reproductive health (Fathalla, Sinding, Rosenfield, & Fathalla, 2006).

Family planning is a core aspect of sexual and reproductive health (The World Health Organization, 2012b). The WHO (The World Health Organization, 2012a) states that:

Family planning allows individuals and couples to anticipate and attain their desired number of children and the spacing and timing of their births. It is achieved through use of contraceptive methods and the treatment of involuntary infertility. A woman's ability to space and limit her pregnancies has a direct impact on her health and well-being as well as on the outcome of each pregnancy.

However, despite the importance of family planning to women's overall physical, social and economic wellbeing, and to the health outcomes of mothers and babies (Cleland et al., 2006; The World Health Organization), it is generally described as 'unfinished business' as a result of unmet needs and health inequities (Cleland et al., 2006; Levi et al., 2009; The World Health Organization, 2012b).

Historically, sexual and reproductive health services and family planning services have evolved separately. However, the WHO contends that strengthening the links between these two services through greater integration would improve health outcomes by expanding access and coverage and better addressing health inequities (Fathalla et al., 2006). Greater integration would be achieved through competency based training in family planning and task-shifting or sharing within the health workforce between doctors, nurses and midwives of specific family services (The World Health Organization, 2012c).

2.4.6.1 The Role of General Practitioners in Sexual and Reproductive Health

Most family planning services in Australia are provided in general practice by GPs (Carney, 1997). However, the high rates of unplanned pregnancy (Read et al., 2009) and infertility (Loxton & Lucke, 2009) in Australia demonstrate the need for innovation in the delivery of family planning services with a greater focus on prevention (Australian Women's Health Network, 2012; Cleland et al., 2006; The World Health Organization, 2012b).

In Australia, GPs are usually the first point of medical contact when couples first become concerned about not conceiving (McLachlan, 2005; Quinn, 2005) and are, therefore, considered ideally placed within the health system to play a role in both prevention and treatment (McLachlan, 2005; Stanford et al., 2008). However, the 2009 BEACH survey has shown a steady decline in the care of infertile people by GPs over the past two decades (Britt & Miller, 2009). Of those couples' who reported trouble conceiving in general practice between 1998 and 2004, only 31.7 per cent were ordered one or more investigations, 73.6 per cent of the females were referred to either gynaecologists, IVF clinics or obstetricians, and 57.9 per cent of the males were referred to either IVF clinics or other (15.8% were not specified) (Charles, Pan, & Britt, 2005). The decline in the care of infertile people in general practice was first noted in the 1990s as a result of increasing referrals to specialists (Britt & Miller, 2009). More recent general practice activity data have shown that the decline in care of infertile people in general practice is continuing (Britt et al., 2011).

2.4.6.2 Innovating the Role of the Practice Nurse to Fill Practice Gaps

The *General Practice Nurse National Survey Report 2012* reported no nurse having attained post-registration qualifications in family planning (Australian Medicare Local Alliance, 2012). However, whilst PNs in Australia are not typically trained in family planning services they have indicated interest in professional development in family planning (Watts et al., 2004) and in expanding their role in sexual health care (Keleher & Parker, 2013).

A key element of the Australian Government's health reforms is to grow the roles of the PN in the delivery of interventions to promote health and prevent disease in areas of identified need (Australian Government Department of Health and Ageing, 2010). Developing the role of the PN to better respond to the health care needs of their community can redress health inequities between different community groups (Parker et al., 2010). A science of self-care is foundational to nursing knowledge and practice (Denyes, Orem, & Bekel, 2001). An important goal of nursing is to promote self-care agency through the acquisition of the necessary knowledge and skills that increase capacity for self-care and care of others (Denyes et al., 2001). This is a core principle of the National Competency Standards for the Registered Nurse (Australian Nursing & Midwifery Council, January 2006b) and the National Competency Standards for the Midwife (Australian Nursing & Midwifery Council, January 2006a).

This part of the review has shown that people who report trouble conceiving in general practice are less likely to receive interventions to reduce infertility and are more likely to be referred on to specialists for tertiary level care at ART clinics. The key elements of a PHC model of care were identified. In the final part of the review, FA is defined and the arguments for and against FA education as one way of reducing infertility in primary care are presented.

2.5 Fertility-Awareness as an Intervention to Reduce Infertility

In discussing FA as one possible way of reducing infertility in the initial assessment and treatment of infertile women, it is important to establish an understanding of the various FA methods commonly available to women, these being self-based methods of FA and over-the-counter home-use fertility tests. The accuracy of each of these methods in identifying the fertile period of the menstrual cycle together with their advantages and limitations when used for timing intercourse for conception is presented below.

2.5.1 Defining Fertility-Awareness

Fertility-awareness is generally defined as a woman's ability to recognise the signs of the fertile days of the menstrual cycle (Pallone & Bergus, 2009). There are three generally accepted methods of FA: rhythm, temperature, and mucus (Pallone & Bergus, 2009). These education-based methods of family planning are also known as natural family planning (NFP) in a more restricted form or periodic abstinence more broadly (The World Health Organization, 2012a).

2.5.2 Fertility-Awareness Methods

Fertility-awareness methods vary in accuracy in identifying the fertile window of the menstrual cycle (Pallone & Bergus, 2009; Stanford, Lemaire, & Thurman, 1998). Below, the rhythm, temperature and mucus methods are summarised along with their advantages and limitations when utilised by women who are having trouble conceiving.

2.5.2.1 Rhythm Method

Introduced in the 1920s (Fehring, 2004; Pallone & Bergus, 2009), the rhythm method estimates the timing of the fertile window of the menstrual cycle by applying mathematical calculations to the longest and shortest menstrual cycle experienced in the previous six to 12 months (Fehring, 2004). These calculations estimate the 'early' safe days and 'late' safe days of the menstrual cycle; the fertile window is the days that fall in between (Fehring, 2004).

Even with correct use, the precise effectiveness of the rhythm method has never been determined (Pallone & Bergus, 2009). Seminal studies of the rhythm method have shown that only 25 per cent (Fehring, Schneider, & Raviele, 2006) and 30 per cent (Wilcox, Dunson, & Baird, 2000) of women who have a monthly menstrual cycle experience the entire fertile window between days 10 to 17; thus, challenging a generally accepted and long held belief (Wilcox et al., 2000). In addition, few women who say they are using rhythm actually apply the necessary calculations (Murayamas et al., 1987).

The rhythm method cannot be applied to the irregular menstrual cycle (Tilly & Jurow, 2010). In the general population between 16 per cent (Wilcox et al., 2000) and 27 per cent (Maheshwari et al., 2008) of women report their menstrual cycle as being irregular. For infertile couples who are seeking assisted conception treatment at ART clinics, female factor fertility problems account for around 35 per cent of the causes (National Institute for Clinical Excellence, 2004), and ovulatory disorders are a major contributing factor (Chavarro et al., 2007). This brief summary of rhythm highlights important limitations of this FA method, whether women are using rhythm to optimise natural conception or as contraception (Stanford et al., 2002; Wilcox et al., 2000).

In addition, rhythm calculations significantly over estimate the duration of the fertile window, necessitating intercourse to occur daily or second daily over many more days than pregnancy is a possibility (Pallone & Bergus, 2009). This approach may be difficult for some couples to maintain (Scarpa, Dunson, & Giacchi, 2007). With this method women cannot know for certain whether intercourse was correctly timed for conception (Stanford et al., 2002; Wilcox et al., 2000).

2.5.2.2 Temperature Method

Introduced in the 1940s, the temperature method retrospectively indicates the occurrence of ovulation in the menstrual cycle (Barron & Fehring, 2005) by a basal body temperature (BBT) rise of 0.2 to 0.5 degrees Celsius that remains elevated until next menstruation (Colombo & Masarotto, 2000; Stanford et al., 2002). The BBT is the resting temperature of the body after a minimum of four to six hours of uninterrupted sleep. The BBT must be taken daily on waking with an ovulation thermometer at the same site, either orally or vaginally. Factors that can cause an inaccurate BBT measurement include alcohol consumption, late nights, oversleeping, disrupted sleep, travel, time zones differences, stress, illness, gynaecological disorders and medication (Pallone & Bergus, 2009).

Ovulation usually occurs at the bottom of the sustained BBT rise (Colombo & Masarotto, 2000; Pallone & Bergus, 2009). The BBT rise has also been found to occur up to one day before to three days after actual ovulation. Some women may ovulate without a clear rise in the BBT in the menstrual cycle (Barron & Fehring, 2005; Guermandi et al., 2001; Martinez et al., 1992). The temperature method is an easy, inexpensive method of FA (Guermandi et al., 2001; Martinez et al., 1992) that has been extensively researched, and found to be a relatively accurate retrospective indicator of ovulation in the menstrual cycle (Colombo & Masarotto, 2000; Guermandi et al., 2001; Martinez et al., 1992). It has also been found to be well accepted by a high proportion of women (Martinez et al., 1992).

With the temperature method, the chance of conceiving is optimised when intercourse is timed within the 3-day-period just prior to actual ovulation (Colombo & Masarotto, 2000; Wilcox et al., 1995). Correct timing of intercourse is best guided using consecutive BBT charts, enabling the timing of ovulation to be anticipated (Martinez et al., 1992). With the temperature method, only in retrospect can a woman know for certain whether intercourse was correctly timed for conception (Colombo & Masarotto, 2000). The retrospective nature of the temperature method is an obvious limitation of this method, highlighting the advantage of combining the temperature and mucus methods (described below) (Pallone & Bergus, 2009). When these methods are combined, the method becomes known as the symptom-thermal method (Colombo & Masarotto, 2000; Pallone & Bergus, 2009). This double check method affords several advantages (Colombo & Masarotto, 2000), and is especially helpful when the menstrual cycle is irregular (Parenteau-Carreau, 1983).

2.5.2.3 Mucus Method

Introduced in the 1950s (Billings & Westmore, 1980), the mucus method prospectively indicates the entire fertile window of the menstrual cycle by the presence of fertile-type mucus at the vulva for an average six days leading up to ovulation (Fehring, 2002; Stanford et al., 2002). This method can be

applied in all menstrual cycles, whether the menstrual cycle is monthly and regular or irregular (Billings & Westmore, 1980; Odeblad, 1994; Pallone & Bergus, 2009). With accurate documentation of the menstrual cycle with the mucus method, a woman can identify the entire fertile window as accurately as some commonly used medical tests, including serial measurement of plasma luteinizing hormone (LH) and serial ultrasound of follicular development in the ovary (Zinaman, 2006).

The mucus method is the most accessible FA method as it requires no special equipment and is inexpensive and less time consuming than FA technologies, such as ovulation prediction tests and ultrasound (Bigelow et al., 2004). The clear advantage of the mucus method over rhythm and temperature is that it provides accurate prospective information about the timing of the fertile window of the menstrual cycle (Bigelow et al., 2004; Zinaman, 2006), and specific changes in the mucus indicate the peak fertile time for optimising the chance of conception (Stanford et al., 2002).

Although many people keep track of aspects of their health ‘in their head’ (Princeton Survey Research Associates International, August 7–September 6, 2012), accurate documentation of the menstrual cycle with FA methods is critical for effective use (Pallone & Bergus, 2009). A seminal study of the Billings Ovulation Method (one of the most well known mucus-based methods of FA), with 869 women in five countries from diverse cultures and socioeconomic backgrounds, found that 93 per cent could identify the fertile window after documenting just one menstrual cycle and 97 per cent could after documenting three. All teachers in the study were trained teachers in the method (Gibbons, Kearns, & Mascarenhas, 1981). This finding is consistent with the results of subsequent studies (Graham, Gosling, & France, 1983; Hilgers, Daly, Prebil, & Hilgers, 1992).

The Billings Ovulation Method, Creighton Model Fertility*Care* System and Sympto-Thermal Method are the most widely used mucus-based methods of FA ((Pallone & Bergus, 2009). Research has been published on both these methods documenting their effectiveness in teaching women fertility charting (Stanford et al., 2002).

Rather than apply one or a combination of the FA methods described above, some women rely on perceived ovulation pain (Sievert & Dubois, 2005) and home-use fertility tests to identify the fertile period of the menstrual cycle (Scolaro, Braxton Loyd, & Helms, 2008).

2.5.2.4 Ovulation Pain

Studies have shown that between six and 52 per cent of women perceive ovulation pain (also known as *mittelschmerz* or middle pain) (Marinho, Sallam, Goessens, Rodeck, & Campbell, 1982; Murayamas et al., 1987; Sievert & Dubois, 2005). Ovulation pain is considered a normal physiological aspect of the menstrual cycle (Muse, 1990). However, not all inter-menstrual pain is normal (Shwayder, 2008), as it can be associated with common gynaecological problems (Muse, 1990). A percentage of women who perceive ovulation pain will have coexisting pathology (Reiter, 1991). Inter-menstrual pain may not be due to one particular cause, but rather related to several factors (Hilgers, Daly, Prebil, & Hilgers, 1981).

Perceived ovulation pain, therefore, should not be relied on as a single indicator of the fertile period of the menstrual cycle but rather noted along with other more reliable indicators (Davis, 1992). This recommendation was exemplified in a seminal study by Sievert and Dubois (2005) who found that while around half (52%) of women believe they knew when they were ovulating because of perceived ovulation pain, only 14 per cent correctly identified the time of ovulation in the menstrual cycle (Sievert & Dubois, 2005). This brief overview of perceived ovulation pain has highlighted important limitations of this approach for timing intercourse for conception.

2.5.2.5 Home-Use Fertility Tests

Home-use fertility tests are a billion-dollar a year industry that continues to grow worldwide (Brezina, Haberl, & Wallach, 2011; Scolaro et al., 2008). In Australia, actual use of these tests among women who are actively planning a pregnancy is largely unknown, as the necessary data is lacking.

The two most commonly purchased over-the-counter home-use FA tests are ovulation prediction tests and saliva-based fertility testers (Scolaro et al., 2008). While these tests can be accurate in the research setting (Maurizio et al., 1999), accuracy and interpretation of the test results with home-use is much more variable (Brezina et al., 2011; Pray & Pray, 2003; Scolaro et al., 2008). A literature review undertaken by Scolaro et al. (2008) to guide pharmacists in women's selection and use of home-use fertility tests concluded that for appropriate choice, correct use and interpretation of test results, women should first be counselled and have a good understanding of the menstrual cycle (Scolaro et al., 2008). Understanding the limitations of these tests was also considered important (Brezina et al., 2011).

Ovulation prediction tests are designed to detect the LH present in urine up to three days prior to the occurrence of ovulation (Direito, Bailly, Mariani, & Ecochard, 2013). The LH surge is classically defined as a single peak, but more recent research has shown much greater variation in the timing and duration of the LH surge in relation to ovulation than previously recorded (Direito et al., 2013). Ovulation prediction tests can be up to 94 per cent accurate when testing coincides with the timing of ovulation. However, determining the correct time to test can be difficult, especially when the menstrual cycle is irregular. In addition, independent research has shown that a large discrepancy exists in the accuracy of some of these tests when compared with the patient product information (Pray & Pray, 2003).

The use of ovulation prediction tests can become expensive when testing needs to occur daily or twice daily over many days before ovulation is detected. Some women may need to test over many menstrual cycles before pregnancy occurs (Scolaro et al., 2008).

Saliva-based fertility testers are designed to detect salt crystals in dried saliva around the time of ovulation in the menstrual cycle (Maurizio et al., 1999). These testers are a one-off purchase and, therefore, much less expensive than ovulation prediction tests when testing needs to occur over many

menstrual cycles. Freudal et al. (2003) tested the accuracy of saliva-based fertility testers for detecting the fertile window of the menstrual cycle against LH measurements in urine and ultrasound monitoring of follicular development in the ovary, and concluded that they are unreliable and, therefore, their use should be discouraged (Freundl et al., 2003). These findings are consistent with an earlier study by Maurizio et al. (1999), who found that saliva-based fertility testers were only 37 per cent accurate in detecting the day of ovulation in the menstrual cycle and that the test results were often un-interpretable (Maurizio et al., 1999).

The critical element of FA, whether infertility is the result of a male factor fertility problem or a female factor fertility problem, is for women to be able to correctly identify the time in the menstrual cycle when intercourse can result in pregnancy.

2.5.3 Arguments For and Against Fertility-Awareness Education

2.5.3.1 Introduction

There are two opposing views about the role of FA education in the primary care of infertile women. Before these different arguments are outlined, some biological facts about the fertile window of the menstrual cycle are presented.

2.5.3.2 The Fertile Window of the Menstrual Cycle

Biologically, the fertile window of the menstrual cycle is defined by the presence of fertile-type mucus at the vulva, as this mucus is essential for the survival of sperm and their capacity to navigate the female reproductive tract (Dunson & Colombo, 2003). Fertile-type mucus is present for an average six days in the menstrual cycle, ending on the day of ovulation (Bigelow et al., 2004; Colombo & Masarotto, 2000; Fehring, 2002; Frank-Herrmann et al., 2005; Freundl et al., 2003; Odeblad, 1994; Stanford et al., 2002; Wilcox et al., 1995). Pregnancy is only a possibility with

intercourse within this window, and that chance increases from eight per cent five days before ovulation to 33 per cent on the day of actual ovulation (Wilcox et al., 1995). Intercourse within the three-day-period just prior to ovulation optimises the chance of pregnancy (Wilcox et al., 1995). No pregnancy has ever been recorded with intercourse outside the fertile window of the menstrual cycle (Colombo & Masarotto, 2000; Wilcox et al., 1995).

Few studies have examined the variability of the menstrual cycle (Fehring et al., 2006). The limited few that have been published have shown greater variation than is generally understood by women (Barron, 2013) and their health care practitioners' (Fehring et al., 2006). The studies have shown that the timing of the fertile window of the menstrual cycle can be highly variable between women (Colombo & Masarotto, 2000; Wilcox et al., 2000) and can also vary between menstrual cycles for the same woman (Cole, Ladner, & Byrn, 2009; Dunson & Colombo, 2003; Keulers, Hamilton, Franx, Evers, & Bots, 2007). Less than a third (25-30%) of women who described their menstrual cycle as monthly and regular experienced the entire fertile window between days 10 and 17 (Fehring et al., 2006; Wilcox et al., 2000). In addition, studies have shown that in 95 per cent of menstrual cycles the fertile window falls somewhere between days 4 and 23 (Fehring et al., 2006), and that the duration of this window can vary from less than one day (Keulers et al., 2007) to up to eight days in length (Colombo & Masarotto, 2000).

As previously noted, around 35 per cent of couples who seek fertility treatment at ART clinics have a female factor fertility problem (National Institute for Clinical Excellence, 2004) and ovulatory dysfunction is a major contributing cause accounting for around 18 to 30 per cent (Chavarro et al., 2007). The causes of ovulatory dysfunction can be divided into three main categories: (1) biomedical (Haywood, 2009; Tingen et al., 2004), (2) poor lifestyles (Chavarro et al., 2007; Homan et al., 2007; Rich-Edwards et al., 2002; Tingen et al., 2004), and (3) individual factors (Stocker, Bewley, Macklon, & Cheong, 2013). Biomedical factors include conditions such as polycystic ovary syndrome, which accounts for the majority (around 70%) of irregular menstrual cycles (Haywood, 2009), advanced

maternal age (ESHRE Capri Workshop Group, 2005), and use of prescribed medication such as asthma medication (Tingen et al., 2004). Poor lifestyle factors include being overweight or underweight (Chavarro et al., 2007; Haywood, 2009; Homan et al., 2007; Rich-Edwards et al., 2002), a sedentary lifestyle (Rich-Edwards et al., 2002), smoking (Haywood, 2009), and poor diet (Chavarro et al., 2007). Individual factors include circumstances such as shift work (Stocker et al., 2013).

The variability of the menstrual cycle underscores the limitations of the rhythm method, whether it is used to optimise the chance of conception (Stanford et al., 2002) or as contraception (Pallone & Bergus, 2009). Conversely, the benefits of the more accurate temperature and mucous methods are reinforced (Stanford et al., 2002).

Despite the variability of the menstrual cycle (Colombo & Masarotto, 2000; Wilcox et al., 2000) (Dunson & Colombo, 2003) and the fact that correctly timed intercourse within the fertile window of the menstrual cycle is a priori for pregnancy (Colombo & Masarotto, 2000; Wilcox et al., 1995), there is disagreement in the literature on the role of FA education in the initial assessment and treatment of women who report trouble conceiving. The main arguments for and against FA education for women who are experiencing trouble conceiving are set out below.

2.5.3.3 The Arguments For and Against Fertility-Awareness Education

For fertile couples attempting pregnancy, the normal conception rate is 15 to 25 per cent per menstrual cycle (Scolaro et al., 2008). In the general population, which includes people with fertility problems and couples of all ages across reproductive life (National Institute for Clinical Excellence, 2004), around 84 per cent of couples will conceive within one year of regular unprotected intercourse, 92 per cent will after two years, and 93 per cent will after three (te Velde et al., 2000).

Observational studies have shown that correctly timed intercourse within the fertile window of the menstrual cycle may shorten the time it takes couples to get pregnancy (Colombo & Masarotto, 2000; Colombo et al., 2006; Gnoth, Godehardt, Godehardt, Frank-Herrmann, & Freundl, 2003; Gnoth et al., 2005; Hilgers et al., 1992; Scarpa et al., 2007; Wilcox et al., 1995). For example, with correctly timed intercourse, Stanford et al. (2002) found that 88 per cent were pregnant at six months rather than at 12 months (Stanford et al., 2002). In another study using the sympto-thermal method for accurate timing, three acts of intercourse within the fertile window reached a conception rate of 0.227 per menstrual cycle, which “corresponds to 4.41 cycles for a pregnancy and a 3.5 per cent of failures in a year” (Colombo & Masarotto, 2000, p. 14). With fertility focused intercourse in apparently healthy couples, no marked differences in pregnancy rates were found in women aged 18 to 24, 25 to 34 and 35 to 39 years (Colombo & Masarotto, 2000).

Proponents of FA education have long argued that FA knowledge provides women with essential information about the menstrual cycle to know how to self-manage their fertility to achieve and avoid pregnancy (Frank-Herrmann et al., 2005; Pyper, 1997; Walsh & Tonti-Filippini, 1998). In addition, they believe that FA knowledge is far more than just basic anatomy and biological facts about the menstrual cycle, it is fundamental to women’s understanding of fertility and reproductive health, and making informed decisions about these important aspects of their life (Bunting & Boivin, 2008; Cachan & Marshall, 1997; Marshall, Jennings, & Cachan, 1997; Pyper, 1997). This includes giving informed consent to fertility interventions (Frank-Herrmann et al., 2005).

Proponents of FA education have also argued that the knowledge is low cost, without side-effects, and compatible with religious or philosophical values of those who may not want to use or choose not to use ART treatment (Bunting & Boivin, 2007; ESHRE Capri Workshop Group, 2004; ESHRE Task Force on Ethics Law, 2009). The potential of an intervention addressing modifiable risk factors for infertility in general practice, including women’s understanding of FA, has been demonstrated in Ireland (Stanford et al., 2008) and in Canada (Tham, Schliep, & Stanford, 2012). The Irish study of 1072 couples who had attempted natural conception for one year or more, were 35 to 48 years of age

(average age was 35.8 years), mean duration of infertility was 5.6 years, and 33 per cent had previously attempted ART treatment. Inclusion criteria included common causes of sub-fertility (for example, unexplained infertility, unexplained recurrent miscarriage, anovulation, polycystic ovary syndrome, endometriosis, male factor, limited cervical mucus, sub-optimal luteal progesterone, sub-optimal oestrogen levels). Exclusion criteria were all causes of sterility (for example, azoospermia, ovarian failure, or bilateral fallopian tube occlusion). Following a thorough history and examination of both partners, care involved both FA and lifestyle education, treatment of co-morbid medical conditions, and fertility enhancing drugs when appropriate (for example, Clomiphene citrate). Fifty-two per cent had achieved a live birth at 24 months. The study found that a comprehensive care plan for infertile couples in general practice can achieve comparable live birth rates to ART treatment (Stanford et al., 2008). The 2012 Canadian study of 108 couples who had attempted natural conception for a mean 3.2 years (average age was 35.4 years) and who had received NaProTechnology (a holistic approach to promoting natural conception and including lifestyle education and FA for correctly timed intercourse) achieved comparable results to the Irish study; at 24 months, 24 per cent had conceived with FA education and correctly timed intercourse alone, 69 per cent conceived with NaProTechnology, and eight per cent had conceived after additional surgical treatment (Tham et al., 2012).

By contrast, *Fertility: assessment and treatment for people with fertility problems (2004)* states that: “people who are concerned about their fertility should be informed that sexual intercourse every two to three days optimises the chance of pregnancy. Timing intercourse to coincide with ovulation causes stress and is not recommended” (National Institute for Clinical Excellence, 2004, p. 8). A number of referred journal articles actively promote this NICE (2004) recommendation (Hargreave & Mills, 1998; Snick, 2005).

A main argument against recommending timed intercourse for conception is that no quality study, such as a randomised controlled trial (RCT), has ever been undertaken that has proven the benefit of

FA education over the chance of spontaneous conception (Snick, 2005). The studies promoting fertility focused intercourse are observational studies only (Colombo & Masarotto, 2000; Gnoth et al., 2003; Hilgers et al., 1992; Wilcox et al., 1995). Without a comparison group in these studies, assessment of association was precluded (Snick, 2005). In addition to these divergent views in the literature concerning FA education in the initial assessment and treatment of infertile women, little is known about FA knowledge, attitudes and practices of women and their PHC practitioners’.

2.5.4 Knowledge of Fertility-Awareness Among Women and Health Practitioners’

This section of the review presents the findings of the literature search examining FA knowledge, attitudes and practices of women and PHC practitioners to establish what they currently know about FA methods and their attitudes to FA education when women first report trouble conceiving in general practice.

2.5.4.1 Fertility-Awareness Among Women

It is widely reported that around four per cent of women in industrialised countries use FA methods as contraception (Stanford et al., 1998; Yusuf & Siedlecky, 1999, 2007). Over the last few decades this estimate has remained relatively stable in Australia (Richters, Grulich, de Visser, Smith, & Rissel, 2003; Walsh & Tonti-Filippini, 1998; Young & Ware, 1979; Yusuf & Siedlecky, 2007), where around three per cent of women from age 25 to 49 years have reported using periodic abstinence as their primary method of contraception (Australian Bureau of Statistics, 1998). In contrast, little is known about use of FA among women who are planning a pregnancy (Stanford et al., 1998). To help establish an understanding of what is generally known about FA in people across reproductive life, this part of the review begins with a study of secondary school students.

Only one study was found exploring fertility knowledge among secondary school students. The study by Ekelin et al. (2012) surveyed 275 secondary students about lifestyle risk factors for infertility, and

found that both boys and girls believed that their knowledge could be improved. Most overestimated the prevalence of infertility and also the chance of conceiving with unprotected intercourse and with ART treatment (Ekelin, Akesson, Angerud, & Kvist, 2012).

Several studies were found that have examined fertility knowledge among tertiary level students. Bretherick et al. (2010) surveyed 360 female Canadian tertiary level students and found that while most were aware that female fertility declined with age, most also significantly overestimated the chances of pregnancy at all ages (Bretherick, Fairbrother, Avila, Harbord, & Robinson, 2010). In another study, Rovei et al. (2010) surveyed 958 Italian students (male and female) about their knowledge of human reproduction and concluded that while most considered parenthood an important part of the adult life, their knowledge of fertility was very poor (Rovei et al., 2010). Similarly, Skoog Svanberg et al. (2006) surveyed 400 Swedish students (half were male and half were female) about human fertility and found very low levels of knowledge, with one in four overestimating a woman's chances of becoming pregnant between the ages of 35 and 40 years (Skoog Svanberg, Lampic, Karlström, & Tydén, 2006).

Novel research by Sivert and Dubios (2005) tested the perception that around half (52%) of female tertiary students believe they always know or sometimes know when they are ovulating. Their perceived signs of ovulation included mucus changes, lower abdominal pain, an increase in body temperature, a sense of well-being, and increased interest in sexual activity. To test the accuracy of women's perceptions, a study of 36 female tertiary students (mean age 28.4 years) with a regular menses was conducted. The women documented their perceived signs of ovulation and also provided urine samples for the detection of the luteinizing hormone (LH) found in urine 24 to 72 hours before ovulation occurs. Nineteen women experienced mucus changes and 6 were correct, 14 reported abdominal pain and 4 were correct, and 10 believed they had ovulated because of changes in libido or mood and 4 were correct. Generalized to the female population, only 14 per cent of women who perceive awareness ovulation pain actually know when they ovulate. No differences were found in the

demographic characteristics of those who correctly perceived the timing of ovulation with those who did not. The demographic characteristics of the sample included age group, years of education, age at menarche, current sexual history, history of pregnancy, history of ovarian cysts, days of menstrual flow, use of drugs for cramping or ovulation pain, smoking, level of exercise, body mass index (BMI), and level of stress (Sievert & Dubois, 2005).

Telephone surveys of knowledge of fertility in relation to contraception and infertility have been undertaken both in the United Kingdom (RxPG News, 2007, June) and in Australia (Hammarberg et al., 2013). The British survey of 500 men and women about human reproduction found that 50 per cent of the respondents did not know the time in the menstrual cycle when a woman is able to get pregnant. The survey was based on the most frequently asked questions by callers to the British Family Planning Association's helpline (RxPG News, 2007, June). The Australian survey of 462 men and women between the ages of 18 and 45 years found that almost 40 per cent had inadequate knowledge of the time in the menstrual when a woman is can conceive (Hammarberg et al., 2013).

Only one study was found that has measured knowledge of FA among infertile women. The study of 80 infertile women who were seeking assisted conception treatment at a New Zealand ART clinic found that only 26 per cent correctly identified the fertile window of the menstrual cycle. All respondents had been trying to conceive for two years or more and had attended at least one GP appointment about trouble conceiving before being referred to the ART clinic. The study was conceived because little was known about FA among infertile women, and anecdotally their knowledge appeared poor. Thirteen per cent had attended a trained teacher in FA methods for FA advice before attending the clinic and, of those, 80 per cent correctly identified the fertile window of the menstrual cycle. Most (83%) indicated interest in seeing a trained teacher in FA methods within the ART clinic. The authors concluded that poor knowledge of FA may be a contributing cause of infertility among women who are seeking assisted conception treatment at ART clinics, and

recommended greater use of trained teachers in FA methods by GPs and fertility specialists for women with poor knowledge (Blake et al., 1997).

Only one qualitative study was found that explored infertile women's understanding of their fertility. The study of 30 culturally diverse South African women who were seeking assisted conception at ART clinics, found that most were aware of their limited fertility knowledge and that many wished to know more (Dyer, Abrahams, Hoffman, & van der Spuy, 2002).

In recognition of women's low levels of use of NFP methods, Stanford et al. (1998) surveyed 1500 women aged 18 to 50 years to determine the underlying reasons (for example, a lack of available information, women's lack of interest or other factors), and found that of those who were still potentially fertile ($n = 484$) 22.5 per cent indicated interest in NFP as contraception and 37.4 per cent for timing intercourse for conception. The authors concluded that NFP may be of particular interest to women who are planning a pregnancy, and suggest that one of the main barriers to its use is a lack of integration into mainstream culture (Stanford et al., 1998).

Even though this review of women's knowledge of FA is not exhaustive, it has shown that there is general agreement in the literature that women's knowledge of fertility is generally poor. No contrary view was found in this review.

2.5.4.2 Fertility-Awareness Among PHC Practitioners'

A number of studies have investigated FA knowledge, attitudes and practices of GPs – also called primary care physicians in some other countries including in the United States of America (Fehring, 2004; Stanford et al., 2002). Far fewer studies have examined these attributes of nurses and midwives, and to my knowledge none have included Australian nurses or midwives. The studies found in this aspect of the review are summarised as follows.

Walsh and Tonti-Filippini (2000) surveyed 30 Australian GPs measuring knowledge and attitudes towards the Billings Method (a mucus-based method of NFP), and found that 77 per cent had insufficient knowledge of the mucous symptom of fertility to help women to conceive and 43 per cent gave unsafe advice for women wishing to avoid pregnancy. The authors concluded that the GPs have insufficient knowledge of the mucus symptom of fertility that would help women self-manage their fertility to achieve and avoid pregnancy (Walsh & Tonti-Filippini, 2000).

Stanford et al. (1999) surveyed of 375 American physicians (most of whom saw women for reproductive issues) and found that while nearly half (46%) mentioned NFP to at least some women when discussing family planning issues, most significantly underestimated the effectiveness of modern NFP methods – temperature and mucus – as contraception and only 36 per cent mentioned the most accurate method (the mucus method) to assist couples to conceive. Of those couples who were given advice to assist conception, 71 per cent of physicians recommended using the temperature method and 64 per cent recommended timing intercourse according to the rhythm method. The physicians who were aware of NFP instructors in their area were significantly more likely to recommend using the mucus method and to refer patients to trained teachers for instruction (Stanford et al., 1999).

A later study by Stanford et al. (2002) concluded that most physicians were unaware of the advances that have occurred in the field of NFP over the last few decades, particularly about the relationship between cervical mucus and the chances of conception in the menstrual cycle (Stanford et al., 2002). Consequently, women who were planning a pregnancy and who were given instructions about timing of intercourse were usually advised of the less helpful rhythm and temperature methods (Stanford et al., 2002).

In a related study, an examination of the sexual and reproductive health content of 122 medical courses in the United States and Canada concluded that most graduates of the courses were

educationally unprepared to provide comprehensive sexual and reproductive health care, as most did not provide comprehensive training on the full range of available contraceptive methods (for example, the greatest emphasis was found on the contraceptive pill) and paid inadequate attention to sexual and reproductive health counselling and socio-economic and racial/ethnic disparities (Steinauer et al., 2009).

Separate studies of 118 peri-natal nurses and 48 physicians, and 514 certified nurse midwives found that most were reluctant to recommend FA methods for family planning to their patients (Fehring, 2004). Fehring, Professor in the College of Nursing, Marquette University, and Director of the Institute for Natural Family Planning, hypothesised that poor preparation of both physicians and nurses in their training courses was a significant barrier to women attaining accurate information and support from these practitioners to use FA methods. He reviewed medical and nurse training course curricula and found that less than one hour was devoted to FA methods. Fehring (2004) contends that FA education fits particularly well with nursing practice because of its holistic and educational focus in promoting patient health. To redress the lack of education and training in FA methods in both medical and nurse training course curricular and improve women's support to use FA methods, Fehring has developed an online professional development training program in FA education at the College of Nursing, Marquette University, USA (Fehring, 2004).

2.6 Overview of Chapter

This chapter has presented the four intersecting areas of literature that have framed and informed this study. Despite the fact that that infertility is an important health issue in Australia and that modifiable risk factors are a major contributing cause, no model of care currently exists in general practice to reduce infertility by addressing these risk factors. Whilst there is general agreement that advanced maternal age and poor lifestyles should be addressed in general practice to reduce infertility, FA as a modifiable risk factor for infertility remains a contentious issue.

Proponents of FA education believe that women's poor understanding of the time in the menstrual cycle when a woman can conceive is missing information in the diagnosis and management of infertility in primary care. However, little is known about FA knowledge, attitudes and practices of Australian women and their PHC practitioners'. Chapter Four sets out the two phase mixed methods design of this study.

CHAPTER THREE: RESEARCH DESIGN

3.1 Introduction

This chapter presents the study design, which used a mixed methods approach (Medical Research Council, 2008). The mixed methods approach combines both quantitative and qualitative research methods in the one study design (Duffy, 1987; Shih, 1998). Proponents of the mixed methods approach contend that the use of both quantitative and qualitative research methods in the one study draws on the unique strengths of each method, and at the same time helps to mitigate against the inherent deficiencies of using a single method approach (Duffy, 1987; Shih, 1998). The mixed methods approach helps to produce a more complete understanding of the subject under investigation, and may help to minimise the researcher's personal bias (Shih, 1998).

In the final analysis of the data sets of this type of study design, the findings of all the investigations are compared and contrasted in an analytical process called triangulation to determine where the findings are convergent, complementary or different. Complementary and convergent findings are those when one data set corroborates the other, and different or divergent findings are those that highlight difference between data sets (Duffy, 1987; Östlund et al., 2011; Shih, 1998). When a hypothesis is tested and confirmed by two or more independent data sets, the overall finding of a study is greatly strengthened (Shih, 1998). Conversely, this type of analysis can also uncover difference and contradiction between methods of the one study (Duffy, 1987; Östlund et al., 2011; Shih, 1998).

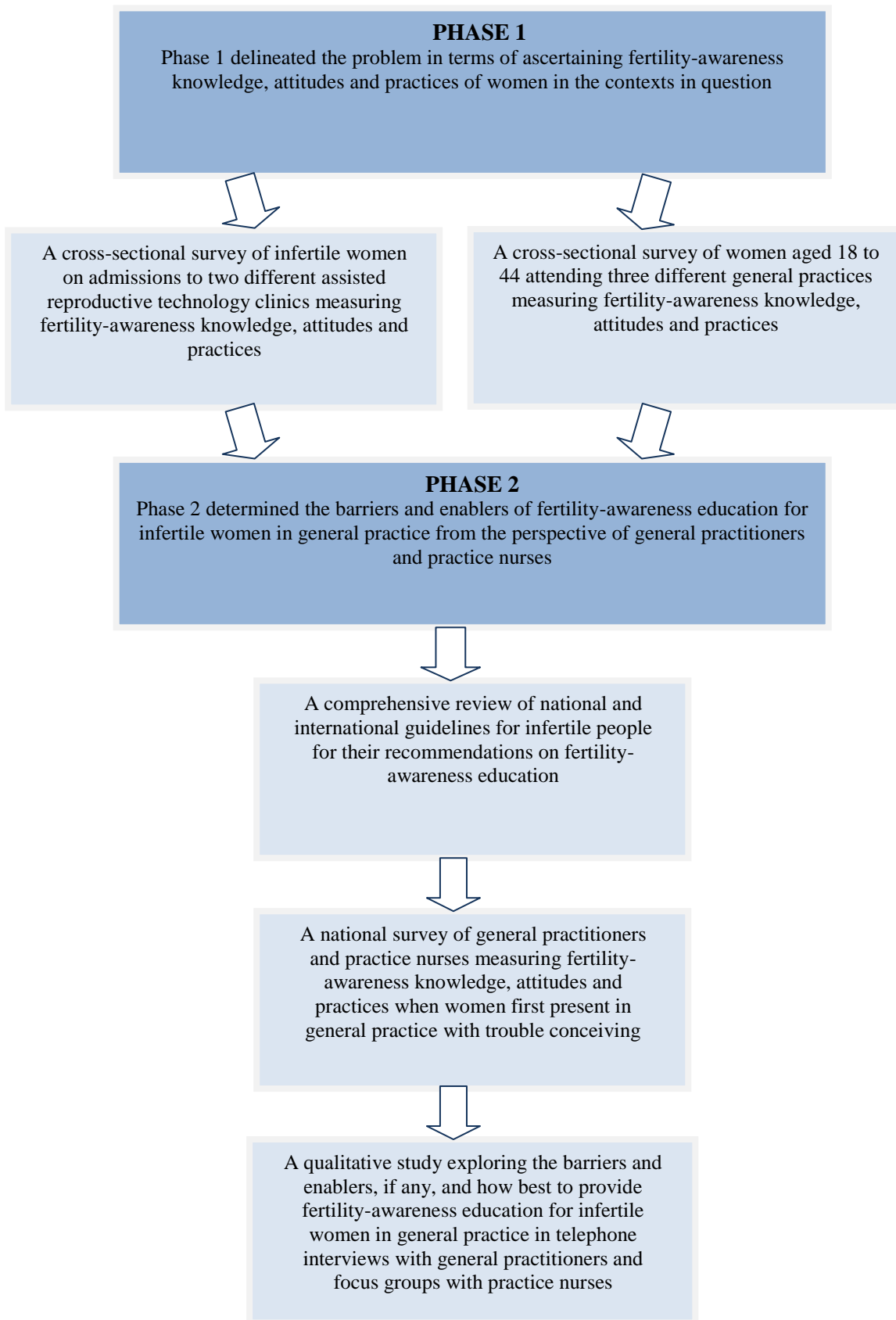
In this study, quantitative methods in the form of surveys were used to measure the nature and extent of FA knowledge in women and PHC practitioners', and to determine their attitudes towards FA education when women first present in general practice with trouble conceiving. A comprehensive

review was conducted of current guidelines for their recommendations concerning FA education in the initial assessment and care of infertile women. Qualitative methods in the form of interviews and focus groups were used to gain insight into the barriers and enablers, if any, and how best to deliver of FA education in general practice from the perspectives of GPs' and PNs'. This phase drew upon Michie et al.'s (2005) theoretical behaviour change framework, which provides a comprehensive set of domains for exploring the barriers and enables of professional development change. The sequence of these different investigations allowed for each data set to be analysed separately, then used to inform the next investigation (Östlund et al., 2011). See Figure 3.1 for the flow chart of the study design.

3.2 Conceptual Framework

A conceptual framework is defined as a flow chart that describes how knowledge will be developed within a particular field of study by describing the research variables and the relationship between the variables (McGaghie, Bordage, & Shea, 2001). The complex intervention framework (Medical Research Council, 2008) was specifically chosen as the conceptual framework to guide this study, as it sets out the essential steps for developing high quality evidence-informed interventions to improve health care from conception through to implementation (Medical Research Council, 2008). The research activities described in this chapter form the Pre-clinical phase of the complex intervention framework (Medical Research Council Health Services and Public Health Research Board, 2000) (see Figure 3.2).

Figure 3.1 Flow Chart of the Study Design



3.3 Developing Complex Interventions

Guidance on developing complex interventions to improve health care is evolving (Craig et al., 2008; Glasziou, 2010; Lenz, 2010). The foundations were first set out by the Medical Research Council Health Services and Public Health Research Board in 2000 (Medical Research Council Health Services and Public Health Research Board, 2000) and more recently refined by the Medical Research Council in 2008 (Medical Research Council, 2008).

The term ‘complex intervention’ comes from the understanding that health interventions typically contain a number of interconnecting components. These may include more than one target population (for example, the patient, practitioner and health setting) (Campbell, 2007) and a range of possible outcomes (Medical Research Council, 2008). The aim of complex interventions is to improve everyday clinical practice (Craig et al., 2008). The Medical Research Council (Medical Research Council, 2008, p.8) states that:

Best practice is to develop interventions systematically, using the best available evidence and appropriate theory, then to test them using a carefully phased approach, starting with a series of pilot studies targeted at the key uncertainties in the design, and moving on to an exploratory and then definitive evaluation.

In developing complex interventions Campbell (2007) states, that interventions should be oriented to:

- (i) target those most affected, most at risk, or most likely to benefit from the intervention;
- (ii) understand the pathways by which the problem is caused or sustained, explore whether the pathways are amenable to change and, if so, at what points and;
- (iii) quantify the potential for improvement (Campbell, 2007).

The complex intervention framework comprises five discrete phases, which are presented in Figure 3.2 (Medical Research Council Health Services and Public Health Research Board, 2000). This study focuses on the Pre-clinical phase of this framework; establishing a theory for the intervention.

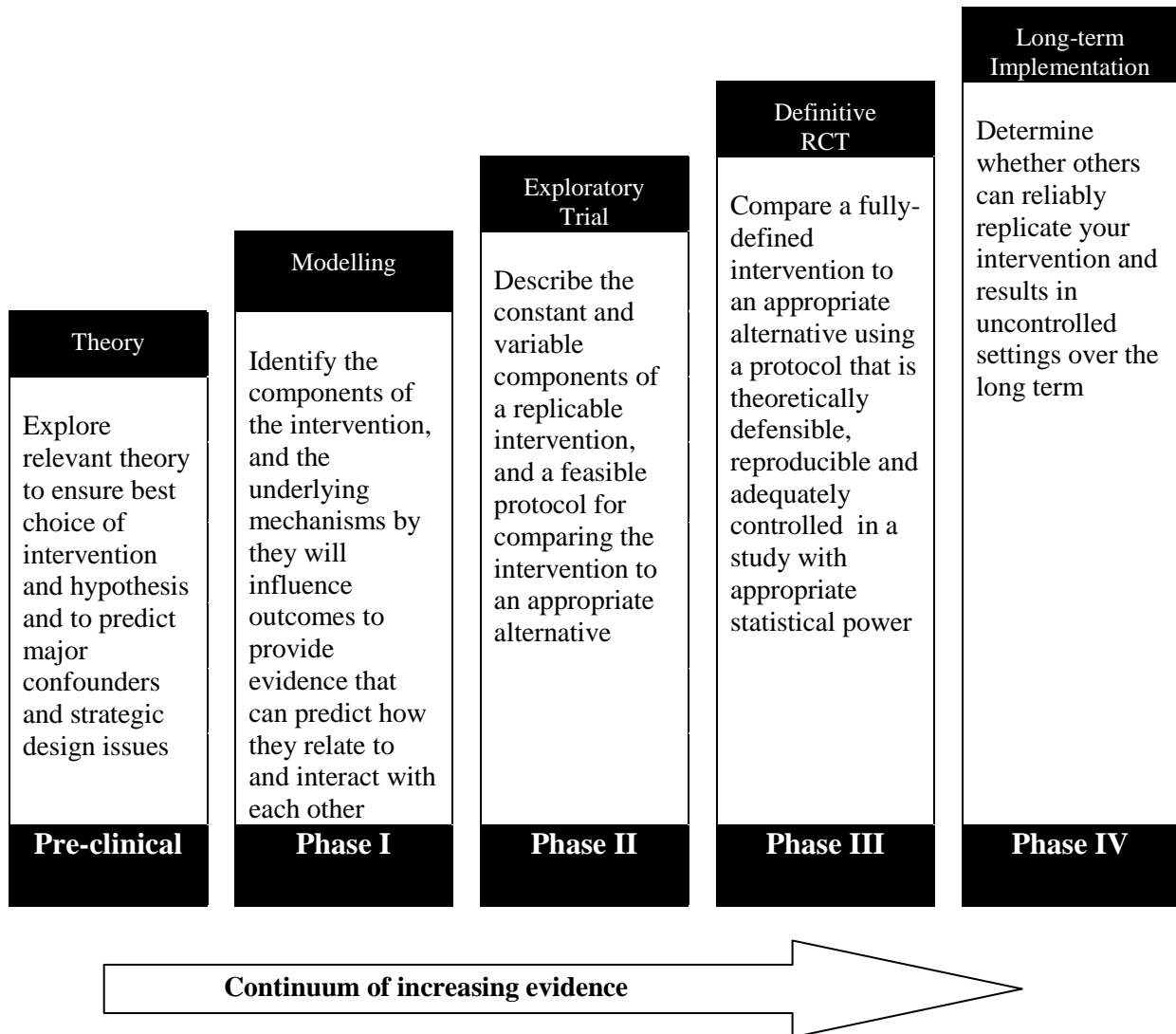


Figure 3.2 Complex Intervention Framework to Improve Health Care (Medical Research Council Health Services and Public Health Research Board, 2000)

The first step in developing a complex intervention is to establish a theoretical basis for the intervention and an understanding of the effect expected from the intervention. In identifying and developing an appropriate theory for an intervention a thorough examination of the relevant literature is first undertaken. This is typically supplemented by additional research drawing upon the experience of ‘stakeholders’, for example, patients and health care providers, targeted by the intervention to help extend and clarify aspects of the theory. This may include for example, establishing a better understanding of attitudes to the intervention and how change can be best achieved. This additional research typically includes the use of both quantitative and qualitative research methods in the one study design (Medical Research Council, 2008; Medical Research Council Health Services and Public Health Research Board, 2000), as reflected in the study design below. Prior to commencing all phases of this study, ethical approval was sought and granted by all relevant authorities.

3.4 Ethics Approval

This study was approved by the Monash University Human Research Ethics Committee (MUHREC), and the ethics committees’ of the participating ART clinics. The project numbers and approval dates for all phases of the study are presented in Appendix 1. Signed Permission Letters were obtained from the participating general practices to recruit their patients into the study, and also from participating Departments’ of General Practice (DGP) (now known as Medicare Locals (MLs)) to recruit GPs and PNs through their newsletters. Informed consent was implied through women’s, GP’s and PN’s voluntary completion of questionnaires. Written informed consent was obtained from all participating GPs and PNs in the interviews and focus groups.

3.5 The Study Design

The mixed methods design of this study has two phases. Phase 1 (see 3.6) delineates the problem from the perspective of women by measuring FA knowledge, attitudes and practices of infertile women on

admission to ART clinics and women attending general practice. Phase 2 (see 3.7) entails three stages, and included a review guidelines for their recommendation concerning FA education in the initial assessment and care of infertile women, a survey of GPs and PNs measuring FA knowledge, attitudes and practices when women first present in general practice with trouble conceiving, and individual telephone interviews with GPs and focus groups with PNs exploring the barriers and enablers, if any, and how best to provide FA education in general practice. The design of this study is set out below.

3.5.1 Hypotheses

This study had three hypotheses:

1. Most infertile women who are seeking assisted conception at ART clinics cannot identify the fertile window of the menstrual cycle. However, these women have greater knowledge of FA than most women attending general practice.
2. Most GPs and PNs currently do not provide FA education, as they are educationally unprepared, having received either no training or minimal training on this topic in their undergraduate courses.
3. Practice nurses will demonstrate a greater interest in professional development than GPs to provide FA education for infertile women.

3.5.2 Aims and Objectives

This study aimed to inform the development of a new model of care to improve the FA of sub-fertile women when first presenting in general practice with trouble conceiving by:

1. Measuring FA knowledge, attitudes and practices of infertile women on admission to ART clinics and women attending general practice;
2. Conducting a comprehensive review of current national and international PHC guidelines for infertile people for their recommendations on FA education;
3. Measuring FA knowledge, attitudes and practice of GPs and PNs when women first present in general practice with trouble conceiving, and;

4. Exploring GP's and PN's views on barriers and enablers, if any, to the provision of FA education in general practice, and how best to deliver this.

3.6 Phase 1

3.6.1 Introduction

Two cross-sectional surveys were utilised as a means of data collection in Phase 1 of this study, incorporating infertile women on admission to ART clinics (see 3.6.3) and women attending general practice (see 3.6.4). The purpose, critical elements and strengths and weaknesses of survey design is described below.

3.6.2 Design

Cross-sectional studies are also known as observational, descriptive or representative studies (Mann, 2003; Seaman, 1987). Cross-sectional studies are often used in health research to establish the prevalence of a health problem within two or more samples of a population at a specific point in time (Mann, 2003). Understanding prevalence is vitally important in health planning as it establishes the likelihood of a health problem in a specific population (Mann, 2003).

Cross-sectional studies are used to infer a relationship between a health problem and other characteristics (for example, age and socio-economic status) of the population being studied, but cannot determine cause-and-effect (Mann, 2003). Importantly, this type of study must be done on representative samples for the findings to be valid, and the sample size must be statistically significant (Mann, 2003). Questionnaires are commonly used in cross-sectional studies (Mann, 2003; Seaman, 1987) to gather information about peoples' knowledge, attitudes, and practices in relation to a health problem (Seaman, 1987). Pilot-testing the questionnaire helps to ensure its validity (Seaman, 1987).

Weaknesses of this design include that it only collects self-reported data. Both self-reported data and low response rates may introduce bias into the findings (Seaman, 1987; van de Mortel, 2008).

Although self-administered surveys are primarily designed to gather quantitative data, open-ended questions are often included to help explain or extend the meaning of the quantitative data gathered, provide quotes to exemplify important points found in the quantitative data, and to bring out related issues that are not easily accessed by closed questions (Chambers & Chiang, 2012). All surveys of this study included an open-ended question inviting the respondents to document any relevant comments they may have in relation to this research.

3.6.3 Women on Admission to ART Clinics

This survey was designed to:

1. Measure FA knowledge, attitudes and practices of infertile women on admission to ART clinics, and;
2. The perceived importance of FA education among infertile women first reporting trouble conceiving to their GP.

3.6.3.1 Instrument

With permission the FA questionnaire developed by Blake *et al.* (1997) was modified to determine detailed knowledge and practice of the rhythm, temperature, and mucus methods. These additional questions were informed by the research evidence in this field (Colombo & Masarotto, 2000; Colombo *et al.*, 2006; Fehring *et al.*, 2006; Gibbons *et al.*, 1981; Odeblad, 1994; Pallone & Bergus, 2009; Sievert & Dubois, 2005; Wilcox *et al.*, 2000) (see 2.5, Chapter Two). The questionnaire was extended to determine attitudes to FA, use of the fertile period, and the socio-demographic characteristics of the sample. One of the ethics committees' of the participating ART clinics requested that women also be asked about their use of home-use fertility tests and whether they found them

useful. The modified questionnaire was then piloted by six ($n = 6$) women in an inner metropolitan women's health clinic. No changes were made to the questionnaire as a result of the pilot study.

The 17-item questionnaire was divided into four parts. Part one gathered the socio-demographic characteristics of the sample, including age group, highest educational level attained, years tried to conceive, number of general practitioner and fertility specialist appointments attended regarding trouble conceiving, infertility diagnosis and average length of the menstrual cycle. Part 2 determined women's knowledge and practice of the rhythm, temperature and mucus methods, and measured use of the fertile period of the menstrual cycle in their attempts at conception. Two questions measured women's use of home-use fertility tests and whether they found them useful. Part three measured attitudes to FA by gathering information about attempts at improving their knowledge of FA methods. Two 5-point Likert scale statements (from strongly agree to strongly disagree) measured perceived importance of FA education when infertile women first report trouble conceiving to their GP. Part four invited participants to document any relevant comments they may have in relation to the research (see Appendix 2 for the questionnaire).

The questionnaire was tested for reliability using Kappa Measure of Agreement in Statistical Package for Social Science (SPSS) (Amos Development Corporation, 1995, Version 17.0) by measuring inter-rater agreement between two experienced women's health practitioners (the student researcher (KH) and a general practitioner (WL)), who independently graded each questionnaire using a predetermined Fertility-Awareness Assessment Sheet into one of four FA categories (none, poor, moderate and high) (see Analysis 3.6.4.4). A resultant Kappa value of 0.823 was achieved (see Table 3.1). A Kappa value of 0.5 represents moderate agreement, above 0.7 represents good agreement, and above 0.8 represents very good agreement (Pallant, 2007).

Table 3.1 Kappa Measure of Agreement between WL and KH

Case processing summary

	Cases					
	Valid		Missing		Total	
	N	%	N	%	N	%
FA assessment WL	204	100	0	0	204	100
FA assessment KH*						

FA assessment WL *FA assessment KH crosstabulation

			KH				
				Poor	Moderate	High	
WL	None	Count	24	1	1	0	26
		% within FA assessment WL	92.3%	3.8%	3.8%	.0%	100.0%
	Poor	Count	0	103	4	2	109
		% within FA assessment WL	.0%	94.5%	3.7%	1.8%	100.0%
	Moderate	Count	0	3	39	10	52
		% within FA assessment WL	.0%	5.8%	75.0%	19.2%	100.0%
	High	Count	0	0	2	15	17
		% within FA assessment WL	.0%	.0%	11.8%	88.2%	100.0%
Total		Count	24	107	46	27	204
		% within FA assessment WL	11.8%	52.5%	22.5%	13.2%	100.0%

Symmetric measures

		Value	Asymp. Std. Error ^a	Approx. T ^b	Approx. Sig.
<i>Measure of Agreement</i>	<i>Kappa</i>	.823*	.034	18.370	.000
<i>Number of Valid Cases</i>		204			

Total sample size, $n = 204$.

* = Kappa value of > 0.8 represents very good agreement.

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

3.6.3.2 Recruitment of Sample

Two different ART clinics, an inner and outer metropolitan ART clinic in a major city of Australia, selected to represent women from diverse socioeconomic backgrounds were drawn from the Socio-Economic Indexes for Areas (SEIFA) (Australian Bureau of Statistics, 2006). The outer metropolitan ART clinic compared with the inner clinic was located in a socio-economical disadvantaged area in terms of house-hold income, education, occupation, and the proportion of non-English speaking background people (Australian Bureau of Statistics, 2006).

All consecutive women on admission to the ART clinics were invited to complete an anonymous questionnaire, either onsite or at home and to return it in a reply-paid envelope, by either a fertility nurse or the student researcher (KH). Women who indicated interest were given the questionnaire with the Explanatory Statement attached (see Appendix 3). Exclusion criteria were: (i) no menstruation in the previous six months; and (ii) women who could not read English. The survey was conducted over six months, from December 2007 to July 2008.

3.6.3.3 The Sample

Based on Blake et al.'s (1997) rate of high FA (26%) among infertile women ($n = 80$), it was determined that a minimum sample size of 172 was required to obtain a 95 per cent confidence level that less than 50 per cent of women who are seeking assisted conception at ART clinics can identify the fertile window of the menstrual cycle (De Vaus, 2002).

3.6.3.4 Analysis

Each questionnaire was graded independently by myself (KH) and WL for FA knowledge and practice using a predetermined Fertility-Awareness Assessment Sheet (see Appendix 2 for the Fertility-Awareness Assessment Sheet). Where a discrepancy occurred, resolution was achieved through review and discussion between both researchers. Table 3.2 presents the methods used for grading FA into one of four categories (none, poor, moderate or high). Only those graded as having high FA were considered to have sufficient knowledge of FA to identify the fertile window of the menstrual cycle.

Table 3.2 Methods for grading fertility-awareness into 1 of the 4 categories

Fertility-Awareness Categories	Methods
<i>None</i>	Answered: ‘Never’ aware of the fertile days of the menstrual cycle
<i>Poor</i>	Awareness of the fertile days was based on a rhythm approach, perceived ovulation pain or poor knowledge of the mucus method
<i>Moderate</i>	Demonstrated accurate knowledge of the mucus method, but had not documented a minimum of 3 menstrual cycles with this method
<i>High</i>	Demonstrated accurate knowledge of either the mucus or temperature method and had documented 3 or more menstrual cycles with either method

The data were analysed in Excel to determine the socio-demographic characteristics of the sample, attitudes to FA, and use of the fertile window. Logistic regression analysis was undertaken in SPSS (Amos Development Corporation, 1995, Version 17.0) to determine the factors associated with higher levels of knowledge of FA. A factor with a *p*-value less than 0.05 was considered statistically significant (Pallant, 2007). The free-text comments offered in the consumer surveys were combined as reported as a whole. Inductive content analysis of the free-text comments was conducted according to the steps set out by Hsieh and Shannon (2005). This type of analysis is organised by a set of agreed steps allowing for key concepts and themes to flow from the text data (Hsieh & Shannon, 2005). First,

the text data was read and re-read to become fully familiar with the content as a whole. Second, words that capture key beliefs or concepts were highlighted and coded with labels. Third, the different codes were organised into categories, then these were later organised into clusters that gave meaning to overall themes within the data. Fourth, each theme was defined for the purpose of reporting the research findings. Exemplars of the text data are presented as quotes to characterise each theme (Hsieh & Shannon, 2005). To increase the trustworthiness of the descriptive evidence of this analysis, the findings are summarised in a table presenting the themes in rank order of importance to the respondents (Chambers & Chiang, 2012).

3.6.4 Women Attending General Practice

This survey was designed to:

1. Measure FA knowledge, attitudes and practices of women attending general practice, with a focus on women actively planning pregnancy or using FA as contraception, and;
2. The perceived importance of FA education when infertile women first report trouble conceiving to their GP.

3.6.4.1 Instrument

The questionnaire was adapted from the previous survey of infertile women who were seeking assisted conception at ART clinics (Hampton, Mazza, & Newton, 2012). Modifications were only made to the part that gathered the socio-demographic characteristics of the sample and the question relating to use of the fertile period was deleted; in all other respects the questionnaire was unchanged. The modified questionnaire was then piloted by 30 ($n = 30$) women in a rural general practice. Only minor changes resulted from the pilot study.

The 14-item questionnaire was divided into four parts. Part one gathered the socio-demographic characteristics of the sample, including age group, highest educational level attained, contraceptive

use, and family planning intention. Part two measured women's knowledge and practice of the rhythm, temperature and mucus methods with detailed questions about each method. Two questions measured women's use of home-use fertility tests and whether they found them useful. Part three measured attitudes to FA by gathering information about attempts at improving their knowledge of FA methods. Two 5-point Likert scale statements (from strongly agree to strongly disagree) measured perceived importance of FA education when infertile women first report trouble conceiving to their GP. Part four invited participants to document any relevant comments they may have in relation to the research (see Appendix 2 for the questionnaire).

The questionnaire was tested for reliability using Kappa Measure of Agreement in SPSS (Amos Development Corporation, 1995, Version 17.0) by measuring inter-rater agreement between two experienced women's health practitioners ((KH) and a women's health nurse (JW)), who independently graded each questionnaire using a predetermined Fertility-Awareness Assessment Sheet into one of four FA categories (none, poor, moderate and high) (see Analysis 3.6.3.4). A resultant Kappa value of 0.925 was achieved, representing very good agreement (see Table 3.3) (Pallant, 2007).

3.4.4.2 Recruitment of Sample

Three different general practices, an inner and outer metropolitan general practice in a major city in Australia and one in rural Victoria, selected to represent women from diverse socioeconomic backgrounds were drawn from the SEIFA (Australian Bureau of Statistics, 2006). The outer metropolitan practice compared with the inner practice was located in a socio-economical disadvantaged area in terms of household income, education, occupation, and the proportion of non-English speaking background people. The rural practice was in a mid-range area (Australian Bureau of Statistics, 2008b).

Table 3.3 Kappa Measure of Agreement between JW and KH

Case processing summary

	Cases					
	Valid		Missing		Total	
	N	%	N	%	N	%
FA assessment JW	328	100	0	0	328	100
FA assessment KH*						

FA assessment JW *FA assessment KH crosstabulation

			KH				Total
			None	Poor	Moderate	High	
JW	None	Count	123	0	0	0	123
		% within FA assessment JW	100.0%	.0%	.0%	.0%	100.0%
	Poor	Count	0	151	6	0	157
		% within FA assessment JW	.0%	96.2%	3.8%	.0%	100.0%
	Moderate	Count	0	7	34	2	43
		% within FA assessment JW	.0%	16.3%	79.1%	4.7%	100.0%
	High	Count	0	0	0	5	5
		% within FA assessment JW	.0%	.0%	.0%	100.0%	100.0%
Total		Count	123	158	40	7	328
		% within FA assessment JW	37.5%	48.2%	12.2%	2.1%	100.0%

Symmetric measures

		Value	Asymp. Std. Error ^a	Approx. T ^b	Approx. Sig.
<i>Measure of Agreement</i>	<i>Kappa</i>	.925*	.019	22.576	.000
<i>N of Valid Cases</i>		328			

Total sample size, $n = 328$.

* = Kappa value of > 0.8 represents very good agreement.

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

All consecutive women aged 18 to 44 years attending the three practices were invited by the receptionists to complete an anonymous questionnaire, either onsite or at home and to return it in a reply-paid envelope. Those who indicated interest were given the questionnaire with the Explanatory Statement attached (see Appendix 3). Exclusion criteria were: (i) no menstruation in the previous six months (excluding pregnancy) and; (ii) women who could not read English. The survey was conducted over six months, from December 2008 to July 2009.

3.6.4.3 The Sample

Based on rates of high FA in women in previous studies, 26 per cent ($n = 80$) (Blake et al., 1997) and 12.7 per cent ($n = 204$) (Hampton et al., 2012), it was determined that a minimum sample size of 233 was required to obtain a 95 per cent confidence level that less than 30 per cent of women attending general practice could identify the fertile window of the menstrual cycle (Creative Research Systems, 1982).

3.6.4.4 Analysis

Each questionnaire was graded independently by myself (KH) and JW for FA using a pre-determined Fertility-Awareness Assessment Sheet (see Appendix 2 for the Fertility- Awareness Assessment Sheet). Where a discrepancy occurred, resolution was achieved through review and discussion between both practitioners. Table 3.3 presents the methods for grading FA into one of four categories (none, poor, moderate, and high). Only those graded as having high FA were considered to have sufficient knowledge of FA to identify the fertile window of the menstrual cycle.

The data were analysed in SPSS (Amos Development Corporation, 1995, Version 17.0) to determine the socio-demographic characteristics of the sample, attitudes to FA, contraceptive use, and family planning intention. Logistic regression analysis was undertaken to determine the factors associated with higher levels of knowledge of FA. A factor with a p - value less than 0.05 was considered statistically

significant (Pallant, 2007). As previously stated, the free-text comments offered in the consumer surveys were combined as reported as a whole (see Analysis 3.6.3.4). The study design of Phase 2 is set out below.

3.7 Phase 2

3.7.1 Introduction

Three different methodologies were utilised as a means of data collection in Phase 2 of this study, incorporated a review of existing guidelines (see 3.7.2), a practitioner survey (see 3.7.3), and interviews and focus groups (see 3.7.4). The purpose, critical elements and strengths and weaknesses of each methodology is set out under each investigation.

3.7.2 The Comprehensive Review

Reviews are tools for summarising evidence accurately and reliably (Liberati et al., 2009). Reviews aim to improve health care (Liberati et al., 2009; Perrier, Mrklas, Lavis, & Straus, 2011) by helping practitioners keep up-to-date in their field, informing policy and clinical practice, and future research (Liberati et al., 2009).

Reviews are guided by a “a clearly formulated question that uses systematic and explicit methods to identify, select, and critically appraise relevant research” (Moher, Liberati, Tetzlaff, Altman, & The, 2009, p. 1). Guidance on conducting reviews is evolving; the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA), published in 2009, is the latest iteration (Liberati et al., 2009). The search strategy utilised in this review is based on PRISMA.

Clinical guidelines are systematically developed statements designed to assist practitioners to improve patient outcomes and quality of care, optimise the best use of resources, and decrease health care expenditure where possible (Klein, 2002; National Institute for Clinical Excellence, 2004). The development of clinical guidelines has proliferated over the last few decades (Scott & Guyat, 2011). However, questions have been raised about the quality, reliability and independence of some guidelines (Klein, 2002; Scott & Guyat, 2011). Guidelines should make clear the degree of uncertainty that underlie the recommendations (Klein, 2002; Scott & Guyat, 2011). Bias in guidelines and when they are not based on the best available evidence may cause harm to patients (Klein, 2002). Prior to conducting this review, The Cochrane Collaboration Library was searched finding that no previous review had been undertaken on this particular topic (The Cochrane Collaboration, 2012).

3.7.2.1 Aims

This review was undertaken to:

1. Determine current guidelines for recommendations concerning fertility-awareness education in the initial care and assessment of infertile people, and;
2. To appraise the recommendations for their evidence base.

3.7.2.2 Data Sources

Guidelines concerning the primary care of infertile people were identified by a comprehensive search of electronic databases, guideline websites and clearing houses, and websites by professional organizations with an interest in infertility. Search terms used were infertil*, sub-fertil*, guideline, primary health care, general practice and family practice.

Only documents that addressed guideline development, recommendations or appraisal in relation to infertility or sub-fertility in primary care published in English from 1995 to 2010 were included. Articles were extracted by the student researcher (KH). The titles and abstracts were first scrutinised,

and the full article was only obtained if it was relevant. The search strategy (see Table 4.17) and the flow chart of documents considered for the review (see Figure 4.7) are presented in Chapter Four.

3.7.3 Practitioner Survey

National surveys provide important information for health planning and frequently inform health policy (Kind, Dolan, Gudex, & Williams, 1998). One good example of a national survey that informs health policy is Australia's Census data (Australian Bureau of Statistics, 2010). The critical elements and overall strengths and weaknesses of survey design have previously been described (see Design 3.6.2).

3.7.3.1 Aims

This survey was undertaken to:

1. Measure FA knowledge, attitudes and practices of GPs and PNs when women report trouble conceiving in general practice, and;
2. Determine which practitioner group, either from within or outside general practice, they believe should provide FA education for women who are having trouble conceiving.

3.7.3.2 Instrument

With permission the 'Brief Physician Opinion Questionnaire on Natural Family Planning (NFP)' developed by Stanford *et al.*(1999) was refined. Modifications were made to measure the clinical practice of GPs' and PNs' when women first present in general practice with trouble conceiving, perception of their own and women's overall level of knowledge of FA, and attitudes to FA education for infertile women. These modifications were informed by the findings of the cross-sectional consumer surveys and the comprehensive review. The modified questionnaire was critically evaluated by 10 ($n = 10$) health science doctoral students in an in-house workshop, then piloted by 13 ($n = 13$) GPs and PNs, resulting in a number of changes to both the phrasing and order of the survey questions.

The 16-item questionnaire was divided into five parts. Part one measured the clinical practice of GPs and PNs when infertile women first report trouble conceiving with three 5-point Likert scale questions (from always to never) for ordering of fertility investigations, providing FA education, and recommended sources of FA information. Part two measured basic knowledge of the temperature and mucus methods with fundamental questions about each method. Two 5-point Likert scale questions (from very high to very low) measured perception of their own and women's overall level of knowledge of FA. Part three measured attitudes to FA education in general practice for women who are having trouble conceiving with three 5-point Likert scale statements (from strongly agree to strongly disagree). A 7-point Likert scale statement (from most definitely, to definitely not) measured interest in professional development in FA methods. A 4-point ranking scale question (from most preferred to least preferred) measured belief about the most preferred practitioner group (GPs, PNs, women's health nurses, midwives or other) to provide FA education. Part four gathered the socio-demographic characteristics of the sample, including age group, gender and whether any education in FA methods had been received during their undergraduate training courses. Part five invited participants to document any relevant comments they may have in relation to the research (see Appendix 2 for the questionnaire).

The questionnaire was tested for reliability in SPSS (Amos Development Corporation, 1995, Version 17) using mean inter-item correlation for three sub-scale items, FA knowledge, attitudes and practice. Resultant values were 0.480 for knowledge, 0.249 for attitudes, and 0.324 for practice. Mean inter-item correlation values above 0.3 are optimal. However, lower values are acceptable with larger samples (Field, 2005); a total sample size of 751 ($n = 751$) was achieved in this survey. Mean inter-item correlation was chosen for reliability testing of the questionnaire as this model is a more accurate measure than Cronbach's alphas coefficient when there are fewer than 10 items in a scale (Field, 2005). There were only two items in the sub-scale of attitude (see Table 3.4).

Table 3.4 Mean inter-item correlation for the sub-scales of fertility-awareness practice, knowledge and attitudes in the practitioner survey

Summary item statistics for practice							
	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Inter-Item Correlations	.324*	-.220	.849	1.069	-3.851	.056	14

Summary item statistics for fertility-awareness knowledge							
	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Inter-Item Correlations	.480*	.417	.601	.184	1.441	.009	3

Summary item statistics for attitudes to fertility-awareness							
	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Inter-Item Correlations	.249*	.249	.249	.000	1.000	.000	2

Total sample size, $n = 751$.

Mean inter-item correlation is the model of choice (rather than Cronbach's alpha coefficient) when there are fewer than 10 items in a scale. The sub-scale for knowledge contained three items and the sub-scale for practice contained two items.

* = mean inter-item correlation values above 0.3 are optimal; however, lower values are acceptable with larger samples.

3.7.3.3 Recruitment of Sample

General practitioners and PNs were surveyed separately. General practitioners were invited to participate in this study via a postal survey, as studies have shown that most (more than 53%) prefer this mode of survey administration (Bonevski, Magin, Horton, Foster, & Girgis, 2011; Hocking, Lim, Read, & Hellard, 2006; Seguin, Godwin, MacDonald, & McCall, 2004; VanGeest, Johnson, & Welch, 2007). Reported postal survey response rates of Australian GPs is typically low; usually less than 30 per cent (Bonevski et al., 2011; Britt et al., 2010; Jones, Dixon, & Dixon, 2012). Response rates are higher when specific strategies are employed, including a shorter questionnaire of mostly closed-ended questions, inclusion of reply-paid envelopes, pre-notification of the survey, follow-up reminders, and the inclusion of a comment promoting a positive outcome for their contribution

(Dillman, 1991). Inaccurate contact details, practitioners being away or on holiday, and the decision within practices not to participate in surveys may reduce response rates (Wiebe, Kaczorowski, & MacKay, 2012). Monetary incentives yield the highest response rates (Creavin, Creavin, & Mallen, 2011; Edwards et al., 2002; Ward, Bruce, Holt, D'Este, & Sladden, 1998; Watkins et al., 2003). However, this strategy was not possible within the scope of this study.

Practice nurses (in Division 1 and Division 2) were invited to participate in the study via email from the Australian Practice Nurses Association (APNA). Studies have shown that online surveys can achieve similar response rates to mail surveys when special populations are targeted who regularly use the internet, especially when the survey is preceded by advance notification (Kaplowitz, Hadlock, & Levine, 2004), careful attention is paid to design (Couper, Traugott, & Lamias, 2001), and with the greater number of contacts (Guise, Chambers, Välimäki, & Makkonen, 2010). Response rates for online surveys are also typically low (around 25-30%) (Cook, Heath, & Thompson, 2000). The APNA is Australia's peak representative Organization of PNs with a seven year history of conducting online surveys of its membership. The majority of their membership (around 97%) is connected to the internet (personal communication, Steve Webster, Programs and Professional Development Manager, APNA, April 28, 2011). When compared with comparative mail surveys, online surveys tend to be slightly better in quality and completeness (Truell, 2003). To reduce the chance of bias in the sample of PNs, paper surveys were administered to PNs attending the 2011 RCNA Community and Primary Health Care Nursing Conference (Hobart). A significant proportion of the conference registrants were PNs (personal communication, RCNA conference organizer, October 21, 2011). The Explanatory Statement advised participants that they could go into the draw to win one of three iPods shuffle 2GB. The contact details of all who participated in the draw were removed from completed questionnaires rendering them anonymous.

Postal surveys with Explanatory Statement and reply-paid envelope attached were mailed to a simple random sample 1000 GPs across Australia. The contact details were purchased through the Australian

Medical Publishing Company (AMPCo) (Australasian Medical Publishing Company Proprietary Limited (AMPCo), 2010), which keeps an up-to-date list of around 23,325 registered GPs working within Australia. A simple random sample is defined as a representative sample (De Vaus, 2002). It was calculated by dividing the total number of GPs registered with AMPCo by the total number of contacts requested (for example, $23,728 / 1000 = 24$). A filter was applied and based on ascending postcode order every 24th GP was selected into the sample, ensuring that it was geographically proportionally across all states and territories of Australia. The questionnaire was mailed to the selected GPs at week one and again at week three; follow-up fax reminders were sent at week two and again at week four.

In Australia, there is no database of PNs from which to draw a simple random sample (Joyce & Piterman, 2009). For this reason a convenience sample of PNs was obtained through the APNA online membership, which represents around one third (2984 of around 9000) of all PNs employed in Australia (personal communication, Steve Webster, Professional Services Manager, APNA, April 11, 2011). According to the *General Practice Nurse National Survey Report 2009*, there were around 8914 nurses employed in general practice (Australian General Practice Network, 2009). Practice nurses were invited to participate in the study via a weekly email over six weeks from the APNA. One weeks advance notification was given prior to the commencement of the online survey. By clicking on a link within the invitation to participate, interested PNs were taken to the online questionnaire (see Appendix 2). Before the questionnaire could be completed, a box was first checked to indicate that the Explanatory Statement (see Appendix 3) had been read and also agreement to participate. Practice nurses attending the 2011 RCNA Community and Primary Health Care Nursing Conference were invited to participate in the study by completing an anonymous questionnaire either onsite or at home and returned in a reply-paid envelope. Participation was invited by the student researcher (KH) who attended the conference. The questionnaire (paper and online) took approximately seven minutes to complete. The survey was conducted over six weeks, from October to November, in 2011.

3.7.3.4 The Sample

Sample size calculations (Creative Research Systems, 1982) determined that a minimum of 378 GPs and 370 PNs were required to obtain a 95 per cent confidence level that more than 50 per cent of GPs and PNs believe that women should receive FA education when first presenting in general practice with trouble conceiving.

Less than the minimum sample size was achieved for GPs ($n = 278$) but was more than adequate for PNs ($n = 473$). Factors that contributed to the low GP sample size included GPs having retired, no longer at the mailing address, being away on leave, and deceased (Wiebe et al., 2012). In addition, several practices advised that they were not general practices but specialist practices providing for example, cosmetic surgery, weight loss and counselling and, therefore, were excluded from the study. Whilst the GP response rate is low, it is similar to that reported in other Australian GP surveys (Bonevski et al., 2011; Britt et al., 2010; Jones et al., 2012) and is considered adequate for meaningful analysis (Jones et al., 2012).

3.7.3.5 Analysis

The data were analysed in SPSS (Amos Development Corporation, 1995, Version 17.0) to determine the socio-demographic characteristics of the sample (see Table 4.18), and FA knowledge, attitudes, and practices of GPs' and PNs' (see Table 4.19). Ordered logistic regression, a 'between groups' model of analysis, was undertaken ranking and comparing factors for FA knowledge, attitudes and practice between GPs and PNs. With this type of analysis, the dependent variables take an ordered discrete value (Borooah, 2002). The dependant variables were knowledge, attitudes and practice, and the covariates were gender, age group, and whether any education in FA methods had been undertaken during their undergraduate training courses (Borooah, 2002). General practitioners and PNs were the comparison groups (or the dichotomous factor), a positive coefficient for a dichotomous factor means more likely, and a negative coefficient for a dichotomous factor means less likely

(Borooah, 2002). In Table 4.20 presenting the results of this analysis, more likely is shown with an upward arrow (↑) and less likely is shown with a downward arrow (↓). A factor with a *p*-value less than 0.05 is considered statistically significant (Borooah, 2002) and is highlighted with an asterisk (*). While the Kruskal-Wallis test is the model of choice when data distribution is non-parametric (Pallant, 2007), ordered logistic regression analysis was specifically chosen for this survey as this non-parametric model of analysis is ideal when data are measured on nominal (categorical) and ordinal (ranked) scales (Borooah, 2002). This type of analysis is useful when samples are small and data do not meet the stringent assumptions of parametric models of analysis (Pallant, 2007). Inductive content analysis of the free-text comments offered in this practitioner survey was conducted as previously described (see Analysis 3.6.3.4).

3.7.4 Practitioner Interviews and Focus Groups

Qualitative research methods help to conceptualise the intervention in the context of patient consultations (Campbell, 2007). Understanding the clinical practice context is crucial to optimising the potential of interventions (Thomson, 2009) and for translating research into clinical practice (Medical Research Council, 2008; Östlund et al., 2011). Qualitative research methods such as focus groups and interviews are increasingly being used in health research (Mason, 2010). These tools are effective techniques for exploring attitudes and clarifying the views of a group, and can generate insights that are not easily accessed using other more conventional data collection techniques (Kitzinger, 1995). Focus groups are designed to stimulate group interaction to help participants explore their knowledge and experiences and to examine why they think the way they do (Kitzinger, 1995). To achieve homogeneity and peer group safety, GPs and PNs were interviewed separately (Elwyn, Edwards, Gwyn, & Grol, 1999; Kitzinger, 1995). Individual telephone interviews were undertaken with GPs as studies have shown that GPs are difficult to recruit into focus groups (Bajramovic, Emmerton, & Tett, 2004) and focus groups were undertaken with PNs.

3.7.4.1 Aims

This approach to data collection was utilised to:

1. Explore the views of GPs and PNs about the barriers and enablers, if any, to FA education in general practice, and;
2. Determine how best to deliver FA education in general practice for women who present with trouble conceiving.

3.7.4.2 Recruitment of Sample

To represent the views of GPs and PNs (in Division 1 and Division 2) from diverse practice settings, participants were drawn from three different Divisions of General Practice (DGP); 1 in inner and outer metropolitan in a major city in Australia and 1 in rural Victoria, according to the SEIFA (Australian Bureau of Statistics, 2006). A DGP is defined as a regional network of general practices (PCHRIS, 2012). During the life of the study all three DGPs were transitioning to become Medicare Locals (MLs) under the Australian Government's health system reforms. The outer metropolitan DGP compared with the inner was located in a socio-economically disadvantaged area in terms of household income, education, occupation, and the proportion of non-English speaking background people. The rural DGP was located in a mid range area (Australian Bureau of Statistics, 2008b). Inclusion criteria were GPs and PNs employed in general practice within the targeted DGP.

General practitioners and PNs were invited to participate in this qualitative phase through advertisements placed in newsletters of the targeted DGP, and by faxing letters with A4 posters of the study attached directly to practices within these divisions. Those interested in participating in the study were invited to contact the student researcher (KH). The Explanatory Statement (see Appendix 3) about the study, Consent Form (see Appendix 3) and details about the interviews or focus groups were faxed to those who agreed to participate. The student researcher phoned to make a time to undertake the interviews and focus groups. The student researcher and a qualified researcher in

qualitative methods (JG) conducted the focus groups, and the student researcher conducted the telephone interviews. Participants were given a \$75.00 Coles/Myer voucher in appreciation of their time and allocated 4 Category 2 points in the RACGP continuing professional development program. The study was conducted over five months, from April to August, in 2012.

3.7.4.3 The Sample

There is general agreement that a guiding principle for determining sample size in qualitative research should be 'saturation' (Mason, 2010). The term 'saturation' in qualitative research is defined as when the collection of new data does not shed any further light on the topic being studied (Mason, 2010). Glaser and Strass (1967) state that: "Qualitative samples must be large enough to ensure that most or all of the perceptions that might be important are uncovered..."(p.2) (Mason, 2010). Factors that influence 'saturation' in qualitative data collection include scope of the topic, the study design, heterogeneity of the sample, interviewer expertise, and expertise of the study participants on the topic (Guest, Bunce, & Johnson, 2006; Mason, 2010). Although studies have shown that as little as 12 interviews can produce saturation, most include around 36 interviews (Guest et al., 2006). Based on the above guidance, the overall study design and the practical limitations of a doctoral study, it was postulated that a sample size of 12 GPs in individual interviews and 30 PNs (10 PNs in three face-to-face focus groups) should be sufficient to produce 'saturation' in the data collection.

Eleven GPs (5 male and 6 female) for individual interviews and 20 PNs (all female in 3 face-to-face focus groups with 5-8 participants in each group) were recruited into this qualitative phase of the study. Nine participants (4 GPs and 5 PNs) were from practices in the high SES area, 10 (3 GPs and 7 PNs) were from practices in the low SES area, and 12 (4 GPs and 8 PNs) were from practices in the rural mid-range SES area; thus, providing fairly even representation of GPs and PNs across all three targeted SES areas. Even though the sample sizes aimed for in the interviews and focus groups were

not achieved, the guiding principle of 'saturation' was achieved deeming the sample size adequate (Mason, 2010). The study was conducted over four months, from April to August, in 2012.

3.7.4.4 Data Collection

Braun and Clarke (2006) contend that the theoretical framework and method used for conducting qualitative research should facilitate what the researcher wants to know and that this should be openly stated (Braun & Clarke, 2006). The aims of this qualitative phase were made explicit in the Explanatory Statement and in the introduction phase of each interview and focus group.

Michie et al's (2005) theoretical behaviour change framework was developed to assist the implementation of evidence-based practice (Michie et al., 2005). Michie et al. (2011) state that there are two aspects to designing behaviour change interventions; first, determining the mode of the intervention and, second, identifying the details necessary for optimising the intervention (Michie, van Stralen, & West, 2011). Michie et al's (2005) theoretical behaviour change framework was specifically chosen for this study as it is a validated framework that provides a definitive set of behaviour change domains that should capture the full range of mechanisms (barriers and enablers) that may be involved in implementing evidence-based practice (Michie et al., 2005).

A 12-item question schedule was developed based on the 12 domains of Michie et al.'s (2005) theoretical behaviour change framework and refined according to the findings of all preceding investigations to date in this study. The 12 domains, which characterise the barriers and enablers of professional development change in clinical practice include: skills, self-standards, self-efficacy, beliefs and consequences, motivations and goals, memory, attention and decision processes, environmental constraints, social influences, emotion, behavioural regulation, and nature of the behaviours (Michie et al., 2005) (see Table 4.22, Appendix 4). The question schedule was piloted in an in-house focus group with three ($n = 3$) health science doctoral students, resulting in a number of

minor alterations. See Appendix 4 for the schedule of questions and corresponding theoretical behaviour change domains. To maintain consistency, the question schedule for the interviews and focus groups was the same. The interviews were approximately 20 minutes in duration and focus groups were approximately 90 minutes.

3.7.4.5 Analysis

All interviews and focus groups were audio-recorded and transcribed verbatim and deductive content analysis was undertaken searching the text data for key concepts and patterns in response to the research questions (Hsieh & Shannon, 2005). Deductive content analysis is also called directed content analysis, as it is based on existing research that helps to focus the research questions (Hsieh & Shannon, 2005). The aim of this type of analysis is to validate or extend what is already known of the subject under investigation (Hsieh & Shannon, 2005).

To thoroughly familiarise myself with the text data the audio-recordings and transcripts were read simultaneously (Hsieh & Shannon, 2005). All transcripts were then re-read twice and coded line by line according to Michie et al.'s (2005) 12 domains. The text data that 'picked up' with a code was underlined. Underlined text data was as small as one line or ran to several. Where there was uncertainty as to which code fitted best, all that could apply were attached. This dilemma was then resolved in the third reading in one of two ways: (1) where the text data was considered to fit one code more than the other, only one code was applied; and (2) where a decision could not be made all possible codes remained attached. The latter situation highlighted a significant overlap of content in several of Michie et al.'s (2005) 12 domains in this study. Any text data deemed not relevant to the research questions were omitted from coding. A category of 'other' was created for any text data that was considered possibly relevant but not easily coded into any of Michie et al.'s (2005) 12 domains.

The coded data was then imported into NVivo 9 software (QSR International Pty Ltd., 2010) for management under Michie et al.'s (2005) 12 domains. All data imported into NVivo 9 software

included the context necessary to understand the citation and to maintain coherence of the transcript. The coded data were then organised into themes and sub-themes. A theme is defined as “something that is important about the data in relation to the research questions, and represents some level of patterned response or meaning within the data set” (Braun & Clarke, 2006, p.82). Both within and between group analysis of GPs and PNs was undertaken comparing and contrasting the themes and sub-themes (Shih, 1998). No text data was coded as ‘other’, suggesting that Michie et al.’s (2005) 12 domains provided a comprehensive framework for exploring the barriers and enablers of FA education in general practice.

Validity and reliability are crucial aspects of qualitative analysis (Chambers & Chiang, 2012; Hsieh & Shannon, 2005). Michie et al.’s (2005) framework is a validated tool for professional behaviour change (Michie et al., 2005). Faithful dedication to coding the data according to Michie et al.’s (2005) framework and adherence to the conventions of directed content analysis ensured integrity of the findings. To increase trustworthiness of the analysis, the findings are reported using both descriptive evidence (Hsieh & Shannon, 2005) and in rank order comparisons of frequency of codes indicating the issues of greatest concern among GPs and PNs in relation to FA education in general practice (Chambers & Chiang, 2012). The analysis was overseen by a highly qualified and experienced qualitative researcher (JN, one of my research supervisors).

3.8 Overview of Chapter

This chapter has presented the mixed methods design of the study. By using both quantitative and qualitative research methods in the one study, examining FA as a modifiable risk factor for infertility from several different perspectives from within Australia’s health system a comprehensive data set will be establish for analysis. In the final analysis of the resultant data sets, the findings of all the investigations are compared and contrasted to determine where they are complementary, divergent or convergent (Duffy, 1987; Östlund et al., 2011; Shih, 1998).

CHAPTER FOUR: RESULTS

4.1 Introduction

This chapter presents the findings of Phase 1 and Phase 2 of the study. It begins with the findings from the two sources of data collection utilised in Phase 1; these being women on admission ART clinics (see 4.2.1) and women attending general practice (see 4.2.2). The analysis of the free-text comments offered by women in these consumer surveys is combined and presented as a whole (see 4.2.4). The findings of Phase 1 are summarised before moving on to present those of Phase 2.

4.2 Phase 1

4.2.1 Women on Admission to ART Clinics

Two hundred and four of 282 distributed questionnaires were completed by infertile women on first admission to ART clinics providing a response rate of 72.2 per cent, which was fairly evenly distributed between the two targeted ART clinics: 105 (51.5%) were completed in the inner metropolitan ART clinic and 99 (48.5%) were completed in the outer metropolitan ART clinic. This relatively high response rate suggests a high acceptance of this study and interest in the topic among infertile women.

4.2.1.1 Socio-Demographic Characteristics

Table 4.1 presents the descriptive characteristics and diagnosed causes of infertility in the sample. Most (170; 83.3%) had tried to conceive naturally for 12 months or more. Only six (0.029%) had not tried to conceive naturally mainly as a result of a diagnosed medical conditions. Nearly all (200; 98.1%) had attended at least one GP appointment about trouble conceiving, and most (125; 61.8%) had attended two or more specialist appointments before ART treatment was recommended. Most

(161; 78.9%) had been given a diagnosis for their infertility. Of those, 23.6 per cent had been diagnosed as having unexplained infertility. Eighty-nine (43.6%) were 36 years or more, and 124 (60.8%) had completed a university degree. One hundred and forty-eight (73.3%) reported having a regular monthly menstrual cycle between 27 and 35 days long.

4.2.1.2 Knowledge and Practice of Fertility-Awareness Methods

Table 4.2 presents knowledge and practice of all three methods of FA methods measured in the survey, showing that all three were both poorly understood and poorly applied by most women. While 178 (88.1%) believed they were either often aware or sometimes aware of the fertile window of the menstrual cycle, only 26 (12.7%) had combined accurate knowledge of either the temperature or mucus method with documentation of three or more menstrual cycles and, therefore, were graded as having high FA. Most infertile women were graded as having either no knowledge of FA (11.8%) or poor knowledge of FA (52.5%) (see Table 4.3). Inter-rater agreement was high with a Kappa value of 0.823.

Table 4.1 Socio-demographic characteristics and diagnosed causes of infertility among infertile women

	N	%	Missing Data
Location of the ART clinics			
Inner metropolitan	105	51.5	
Outer metropolitan	99	48.5	
Age group			
25 years or less	4	2.0	
26-35 years	111	54.4	
36 years or older	89	43.6	1
Highest level of education attained			
Completed primary school	2	1.0	
Completed secondary school	55	27.0	
Completed a TAFE course	21	10.3	
Completed a university degree	124	61.8	2
Average length of menstrual cycle			
26 days or less	26	12.9	
27-35 days	148	73.3	
>35 days	12	5.9	
Irregular	16	7.9	2
Years tried to conceive naturally			
Less than 1 year	28	13.7	
1-2 years	100	49.0	
3 years or more	70	34.3	
Had not attempted natural conception	6	0.29	
Number of general practitioner consultations attended			
1 only	99	48.5	
2-3 times	76	37.3	
4 times	25	12.3	4
Number of fertility specialist consultations attended			
1 only	77	37.7	
2-3 times	84	41.2	
4 times	41	20.6	2
Given a diagnosis for their infertility			
Yes	161	78.9	
No	38	18.6	5
Diagnosed causes of infertility*			
Combined male and female factor problems	141	87.5	
Male Factor	59	36.6	
Unexplained	38	23.6	
Blocked fallopian tubes	29	18.0	
Poly cystic ovaries (PCOS)	28	17.3	
Endometriosis	29	18.0	
Other: poor organ development, no fallopian tubes, ovarian malignancy, abnormal ovarian reserve, previous ectopic pregnancy, mumps, vasectomy, lupus erythematosus, tubal ligation and carriers of genetic disorders	16	0.09	

Total sample size, $n = 204$.

*Note: More than one diagnostic category of infertility could be ticked, therefore, numbers do not add up to the total number ($n = 204$) of those who were given a diagnosis for their infertility.

Table 4.2 Fertility-awareness knowledge and practices in infertile women

	N	%	Missing Data
Rhythm method			
<i>Are you aware of the fertile days of the menstrual cycle?</i>			
<i>Never aware</i>	24	12.9	
<i>Sometime aware</i>	85	42.1	
<i>Often aware</i>	93	46.0	2
Perceived ovulation pain			
<i>Never</i>	51	28.3	
<i>Sometimes</i>	92	51.1	
<i>Often</i>	37	20.6	24
Mucus method			
<i>Are you aware of vaginal mucus secretion changes in the menstrual cycle?</i>			
<i>Never</i>	30	14.7	
<i>Sometimes</i>	93	45.5	
<i>Often</i>	58	28.4	23
<i>Do you know the mucus type that indicates the fertile days?*</i>			
<i>Yes</i>	99	65.5	
<i>No</i>	105	34.5	
<i>Accurately described the mucus change that indicates the beginning of the fertile days^a</i>	44	44.4	
<i>Accurately described the mucus change that indicates the end of the fertile days^a</i>	34	34.3	
<i>Had documented 3 or more menstrual cycles with this method^a</i>	28	28.2	
Temperature method			
<i>Have you ever used the temperature method to identify ovulation in the menstrual cycle?</i>			
<i>Yes</i>	72	35.2	
<i>No</i>	103	50.4	29
<i>Knew the temperature change that indicates the occurrence of ovulation^a</i>	11	15.2	7
<i>Knew the timing of ovulation in relation to the temperature change^a</i>	14	19.4	2
<i>Had documented 3 or more menstrual cycles with this method^a</i>	50	69.4	

Total sample size, $n = 204$.

* Respondents answered “Sometimes” or “Often” to the previous question.

^a. Respondents answered “Yes” to the previous question.

4.2.1.3 Use of the Fertile Period of the Menstrual Cycle

While few (only 12.7%) infertile women were graded as having high FA, most (122; 68.2%) believed they had correctly timed intercourse mostly within the fertile window of the menstrual cycle in their attempts at natural conception before seeking tertiary level fertility care at the ART clinics (see Table

4.3). These findings show that a significant gap exists between perceived FA and actual FA among most infertile women (see Table 4.4).

Table 4.3 Use of the fertile period of the menstrual cycle among infertile women

	N	%	Missing Data
<i>When you and your partner were trying to get pregnant, did you have intercourse at:</i>			
<i>Any time in the menstrual cycle</i>	55	30.7	
<i>Not sure</i>	2	1.1	
<i>Mainly within the fertile days</i>	122	68.2	25

Total sample size, $n = 204$.

Table 4.4 Grading of infertile women into 1 of 4 fertility-awareness categories, and comparing perceived fertility-awareness against actual fertility-awareness in these women

	N	%	Missing Data
<i>Fertility-awareness categories</i>			
<i>None</i>	22	12.7	
<i>Poor</i>	106	51.9	
<i>Moderate</i>	48	23.5	
<i>High</i>	26	12.7	
<i>Perceived awareness of the fertile days</i>			
<i>Never aware</i>	24	11.7	
<i>Sometime aware</i>	85	41.6	
<i>Often aware</i>	93	45.5	2

Total sample size, $n = 204$.

4.2.1.4 Attitudes to Fertility-Awareness Education

Attitudes to FA among infertile women were generally very positive. Most either strongly agreed or agreed that correctly timed intercourse within the fertile window of the menstrual cycle may help some infertile couples to conceive (150; 75.4%), and that women should receive FA education when first reporting trouble conceiving to their GP (191; 94.5%) (see Table 4.5). Consistent with these attitudes to FA, most women (157; 86.8%) actively tried to improve their knowledge of FA from one or more sources of the information. Table 4.6 lists the number and type of different sources of FA information individual women had accessed. Of those who actively tried to improve their knowledge

of FA, only 63 (40.1%) sought and were offered the information by their GP, and far fewer saw a trained teacher in FA methods (10; 6.3%) (see Table 4.6).

Table 4.5 Attitudes to fertility-awareness among infertile women

	N	%	Missing Data
<i>Timing sexual intercourse within the fertile time of the menstrual cycle can help some infertile couples to conceive.</i>			
<i>Strongly agreed or agreed</i>	150	75.4	
<i>Undecided</i>	36	18.1	
<i>Disagreed or strongly disagreed</i>	13	6.5	5
<i>A woman should receive FA education to increase her awareness of the fertile time in the menstrual cycle when she first reports trouble conceiving to her doctor.</i>			
<i>Strongly agreed or agreed</i>	191	94.5	
<i>Undecided</i>	9	4.5	
<i>Disagreed or strongly disagreed</i>	2	1.0	2

Total sample size, $n = 204$.

Table 4.6 Number and type of different sources of fertility-awareness information accessed by infertile women

	N	%	Missing Data
<i>Actively tried to improve their FA knowledge from 1 or more sources of the information</i>			
<i>Yes</i>	157	86.8	
<i>No</i>	24	13.2	22
<i>Sources of the information*^a</i>			
<i>Internet</i>	101	64.3	
<i>Books</i>	89	56.6	
<i>General practitioner</i>	63	40.1	
<i>Friends</i>	54	34.3	
<i>IVF clinic</i>	37	23.5	
<i>Trained teacher in FA methods</i>	10	6.5	
<i>Other</i>	6	3.8	
<i>Number of different FA information sources individual women had accessed^a</i>			
<i>1</i>	48	30.5	
<i>2</i>	45	28.6	
<i>3</i>	35	22.2	
<i>4 or more</i>	29	18.4	

Total sample size, $n = 204$.

* Note: Respondents could tick more than one source of FA information, therefore numbers do not add up to the total number ($n = 157$) of those who actively tried to improve their FA knowledge.

^a Respondents answered “Yes” to the previous question.

4.2.1.5 Home-Use Fertility-Awareness Tests

Just over half (93; 52.0%) of infertile women had ever used ovulation prediction tests, and, of those, around half (55.9%) found them useful. Fewer (74; 41.3%) had ever used saliva-based fertility testers, and, of those, just over a fifth (20.3%) found them useful (see Table 4.7).

Table 4.7 Number of infertile women who had used home-use fertility tests

	N	%	Missing Data
<i>Have you ever used ovulation prediction tests to identify the timing of ovulation in the menstrual cycle?</i>			
Yes	93	52.0	
No	86	48.0	25
<i>Did you find them useful? *</i>			
Yes	52	55.9	
No	35	37.6	6
<i>Have you ever used a saliva-based fertility tester to identify the timing of ovulation in the menstrual cycle?</i>			
Yes	74	41.3	
No	105	58.7	25
<i>Did you find the tester useful? *</i>			
Yes	15	20.3	
No	56	75.7	4

Total sample size, $n = 204$.

*Respondents answered “Yes” to the previous question.

4.2.1.6 Factors Associated with Higher Levels of Knowledge

Logistic regression analysis of infertile women revealed that those women with higher levels of knowledge of FA had accessed a greater a number of FA information sources ($P = 0.001$) (95% CI: 0.177 to 0.714) and used ovulation prediction tests ($P = 0.038$) (95% CI: 0.040 to 1.401). No association was found between higher levels of knowledge of FA and location of the two ART clinics (that is, inner or outer metropolitan in a major city in Australia according to the SEIFA), age group, years tried to conceive, number of GP or fertility specialist appointments attended, highest educational level attained, diagnosed cause of infertility or any one particular source of the information (see Table 4.8).

Table 4.8 Factors associated with higher levels of knowledge of fertility-awareness among infertile women

	Estimate	OR	95%		Sig.
			LCL	UCL	
Location of the ART clinics					
High SES area	0.496	1.642	0.843	3.198	.144
Age group					
26-35 years	-1.699	0.183	0.012	2.707	.217
36 years or older	-1.433	0.239	0.015	3.681	.304
Highest level of education attained					
Completed a university degree	0.710	2.034	0.985	4.200	.058
Years tried to conceive naturally					
1-2 years	0.208	1.231	0.412	3.675	.709
3 years or more	0.501	1.650	0.511	5.329	.402
Number of GP consultations					
2-3 times	-0.099	0.906	0.422	1.945	.800
4 times	0.393	1.481	0.506	4.337	.473
Number of fertility specialist consultations					
2-3 times	0.778	2.177	0.996	4.759	.051
4 times	-0.159	0.853	0.325	2.237	.761
Given a diagnosis for their infertility					
Yes	0.507	1.660	0.666	4.139	.276
A greater a number of sources of FA information					
	0.445	1.560	1.193	2.041	<.001*
Home-Use Fertility Tests					
Ovulation prediction tests	0.720	2.054	1.041	4.056	.038*
Saliva-based fertility testers	-0.105	0.900	0.447	1.813	.768

Total sample size, $n = 204$.

* = significant p -value of < 0.05 .

4.2.2 Women Attending General Practice

Three hundred and twenty-eight of 510 distributed questionnaires were completed by women who were attending general practice providing a response rate of 64.3 per cent. While this response rate is below that which was achieved in the survey of infertile women, it is still relatively high and was fairly evenly distributed between the targeted practices: 123 (37.5%) were completed in the inner metropolitan practice, 102 (31.4%) in the outer metropolitan practice and 102 (31.1%) in the rural practice.

4.2.2.1 Socio-Demographic Characteristics, Contraceptive Use, and Family Planning Intention

Table 4.9 presents the descriptive characteristics of the sample. Thirty-two (9.8%) were actively planning pregnancy. Of the 185 (56.3%) who were using one or more contraceptive methods, 8 (4.3%) were using only FA or FA in combination with condoms or ‘withdrawal’. Most were aged 26 to 35 years (162; 49.4%), had completed a university degree (179; 55.1%), and reported having a regular monthly menstrual cycle between 27 and 35 days long (190; 58.8%).

4.2.2.2 Knowledge and Practice of Fertility-Awareness Methods

Table 4.10 presents knowledge and practice of all three methods of FA measured in the survey. Consistent with the findings of the previous survey of infertile women, this survey shows that all three FA methods were poorly understood and applied by most women attending general practice. Most (205; 63.9%) women attending general practice also believed that they were either often aware or sometimes aware of the fertile window of the menstrual cycle, when few (7; 2.1%) were graded as having high FA. Most women attending general practice were graded as having either no knowledge of FA (38.1%) or poor knowledge of FA (47.9%) (see Table 4.11). Inter-rater agreement was high with a Kappa value of 0.925 (Pallant, 2007).

Table 4.9 Socio-demographic characteristics, contraceptive use and pregnancy intentions among women attending general practice

	N	%	Missing Data
Location of the general practices			
<i>Inner metropolitan</i>	123	37.5	
<i>Outer metropolitan</i>	103	31.4	
<i>Rural</i>	102	31.1	
Age group			
<i>25 years or less</i>	67	20.4	
<i>26-35 years</i>	162	49.4	
<i>36 years or older</i>	99	30.2	
Highest level of education attained			
<i>Completed primary school</i>	11	3.4	
<i>Completed secondary school</i>	98	30.2	
<i>Completed a TAFE course</i>	37	11.4	
<i>Completed a university degree</i>	179	55.1	3
Average menstrual cycle			
<i>26 days or less</i>	53	16.4	
<i>27-35 days</i>	190	58.8	
<i>>35 days</i>	9	2.8	
<i>Irregular</i>	31	9.6	
<i>No period in past 6 month (pregnant)</i>	40	12.3	5
Currently using contraception			
<i>Yes</i>	185	56.3	
<i>No</i>	143	43.7	1
Contraceptive methods*			
<i>Oral contraceptive pill</i>	93	50.5	
<i>Male condom</i>	49	26.6	
<i>Implanon</i>	5	2.7	
<i>Depo-Provera</i>	2	1.0	
<i>'Withdrawal'</i>	6	3.2	
<i>Tubal ligation or Vasectomy</i>	9	4.8	
<i>Intrauterine device</i>	13	7.0	
<i>Only natural birth control (rhythm, mucus or temperature methods) or natural birth control in combination with condoms or 'withdrawal'</i>	8	4.3	
Pregnancy intention categories			
<i>I have completed my family</i>	109	33.3	
<i>I plan to have children in the future</i>	125	38.2	
<i>I have no plans to have children</i>	15	4.6	
<i>I am currently planning a pregnancy</i>	32	9.8	
<i>I am currently pregnant</i>	46	14.1	1

Total sample size, $n = 328$.

*Respondents answered "Yes" to the previous question. Contraceptives, including spermicide, female condom, diaphragm, NuvaRing and contraceptive sponge are not included in this list as no woman reported their use.

Table 4.10 Fertility-awareness knowledge and practices in women attending general practice

	N	%	Missing Data
Rhythm method			
<i>Are you aware of the fertile days in the menstrual cycle?</i>			
Never aware	116	36.1	
Sometime aware	113	35.2	
Often aware	92	28.7	7
Perceived ovulation pain			
Never	73	27.7	
Sometimes	97	41.3	
Often	65	27.7	93
Mucus method			
<i>Are you aware of vaginal mucus secretion changes in the menstrual cycle?</i>			
Never	37	16.0	
Sometimes	95	41.1	
Often	99	42.9	97
<i>Do you know the mucus type that indicates the fertile days?*</i>			
Yes	92	47.4	
No	106	54.6	136
<i>Accurately described the mucus change that indicates the beginning of the fertile days^a.</i>			
	58	63.0	
<i>Accurately described the mucus change that indicates the end of the fertile days^a.</i>			
	36	39.1	
<i>Had documented 3 or more menstrual cycles with this method^a.</i>			
	15	16.3	
Temperature method			
<i>Have you ever used the temperature method to identify ovulation in the menstrual cycle?</i>			
Yes	26	11.7	
No	197	88.8	105
<i>Knew the temperature change that indicates the occurrence of ovulation^a.</i>			
	5	19.2	
<i>Knew the timing of ovulation in relation to the temperature change^a.</i>			
	3	11.5	
<i>Had documented 3 or more menstrual cycles with this method^a.</i>			
	16	61.5	

Total sample size, $n = 328$.

* Respondents answered “Sometimes” or “Often” to the previous question.

^a. Respondents answered “Yes” to the previous question.

Table 4.11 Grading of women attending general practice into 1 of 4 fertility- awareness categories, and comparing perceived fertility-awareness against actual fertility- awareness in these women

	N	%	Missing Data
<i>Fertility-awareness categories</i>			
<i>None</i>	125	38.1	
<i>Poor</i>	157	47.9	
<i>Moderate</i>	39	11.9	
<i>High</i>	7	2.1	
<i>Perceived awareness of the fertile days</i>			
<i>Never aware</i>	116	36.1	
<i>Sometime aware</i>	113	35.2	
<i>Often aware</i>	92	28.7	7

Total sample size, n = 328.

4.2.2.3 Attitudes to Fertility-Awareness Education

Attitudes to FA among women attending general practice for women who are having trouble conceiving were remarkably similar to those of infertile found in the previous survey. Most either strongly agreed or agreed that timed intercourse within the fertile window may help some infertile couples to conceive (240; 76.7%), and that women should receive FA education when first reporting trouble conceiving to their GP (293; 92.2%) (see Table 4.12).

Compared with infertile women who were seeking assisted conception treatment, fewer women (93; 37.1%) attending general practice actively tried to improve their knowledge of FA from one or more sources of the information. Table 4.13 lists the number and type of different sources of FA information individual women had accessed, showing that 45 (28; 30.1%) sought and were offered the information by their GP.

Table 4.12 Attitudes to fertility-awareness education among women attending general practice

	N	%	Missing Data
<i>Timing sexual intercourse within the fertile time of the menstrual cycle can help some infertile couples to conceive.</i>			
<i>Strongly agreed or agreed</i>	240	76.7	
<i>Undecided</i>	51	16.3	
<i>Disagreed or strongly disagreed</i>	21	6.7	16
<i>A woman should receive FA education to increase her awareness of the fertile time in the menstrual cycle when she first reports trouble conceiving to her doctor.</i>			
<i>Strongly agreed or agreed</i>	293	92.2	
<i>Undecided</i>	14	4.4	
<i>Disagreed or strongly disagreed</i>	11	3.4	10

Total sample size, $n = 328$.

Table 4.13 Number and type of different sources of fertility-awareness information individual women attending general practice had accessed

	N	%	Missing Data
<i>Actively tried to improve their FA from 1 or more sources of the information</i>			
<i>Yes</i>	93	37.1	
<i>No</i>	158	62.9	77
<i>Sources of the information*</i>			
<i>Internet</i>	37	39.8	
<i>Books</i>	63	67.7	
<i>General practitioner</i>	28	30.1	
<i>Friends</i>	22	23.7	
<i>IVF clinic</i>	18	19.4	
<i>Trained teacher in FA methods</i>	7	7.5	
<i>Other</i>	1	0.01	
<i>Number of different FA information sources individual women accessed</i>			
<i>1</i>	31	33.3	
<i>2</i>	27	29.0	
<i>3</i>	11	11.8	
<i>4 or more</i>	5	5.3	19

Total sample size, $n = 328$.

*Note: More than one source of FA information could be ticked, therefore numbers do not add up to the total number ($n = 93$) of those who actively tried to improve their FA knowledge.

4.2.2.4 Home-Use Fertility-Awareness Tests

Compared with infertile women, fewer women attending general practice had ever used home-use fertility tests. Only 28 (11.9%) had used ovulation prediction tests, and, of those, most (22; 78.5%) found them useful. Even less (10; 4.3%) had ever used saliva-based fertility testers, and, of those, half (5; 50.0%) found them useful (see Table 4.14).

Table 4.14 Number of women attending general practice who had used home-use fertility tests

	N	%	Missing Data
<i>Have you ever used ovulation prediction tests to identify the timing of ovulation in the menstrual cycle?</i>			
Yes	28	11.9	
No	207	88.1	93
<i>Did you find them useful?*</i>			
Yes	22	78.5	
No	10	35.7	6
<i>Have you ever used a saliva-based fertility tester to identify the timing of ovulation in the menstrual cycle?</i>			
Yes	10	4.3	
No	224	95.7	94
<i>Did you find the tester useful?*</i>			
Yes	5	50.0	
No	5	50.0	

Total sample size, $n = 328$.

*Respondents answered “Yes” to the previous question.

4.2.2.5 Factors Associated with Higher Levels of Knowledge

Logistic regression analysis revealed that higher levels of knowledge of FA were associated with women who had completed their family ($P = 0.025$) (95% CI: 0.169 to 2.520) or planned to have children ($P = 0.023$) (95% CI: 0.182 to 2.514) compared with women who had no plans to have children, being age 36 years or more ($P = 0.005$) (95% CI: 0.370 to 2.087), having attained the information from books ($P = 0.024$) (95% CI: 0.107 to 1.526) and trained teachers in FA methods ($P = 0.028$) (95% CI: 0.186 to 3.313). No association was found between higher levels of knowledge of FA and women who were using of FA as contraception ($P = .83$) (95% CI: -1.536 to 1.240) compared with women using other contraceptive methods including the oral contraceptive pill ($P = .22$) (95% CI:

-.199 to .839) and condoms (P =.60) (95% CI: -.486 to .830). Consistent with the findings of the previous survey of infertile women, no association was found between higher levels of knowledge of FA and location of the three general practices (that is, inner and outer metropolitan in a major city in Australia or rural Victoria according to the SEIFA) (see Table 4.15).

Table 4.15 Factors associated with higher levels of knowledge of fertility-awareness among women attending general practice

	Esti- mate	OR	95%		Sig.
			LCL	UCL	
Location of practices					
<i>Inner metropolitan</i>	.089	1.093	0.580	2.059	.784
<i>Rural</i>	-.436	0.647	0.339	1.235	.187
Age group					
<i>26-35 years</i>	.326	1.385	0.736	2.609	.313
<i>36 years or older</i>	1.228	3.414	1.447	8.057	.005*
Highest level of education attained					
<i>Completed secondary school</i>	-.474	0.623	0.195	1.986	.423
<i>Completed a TAFE course</i>	-.131	0.877	0.248	3.106	.839
<i>Completed a university degree</i>	-.102	0.903	0.287	2.837	.861
Average menstrual cycle					
<i>26 days or less</i>	.513	1.670	0.796	3.504	.175
<i>27-35 days</i>	.427	1.533	0.870	2.701	.139
<i>>35 days</i>	-.805	0.447	0.106	1.877	.271
Contraceptive methods*					
<i>Oral contraceptive pill</i>	.320	1.377	0.819	2.315	.227
<i>Male condom</i>	.172	1.188	0.615	2.295	.608
<i>Natural birth control only or in combination with condoms or 'withdrawal'</i>	-.148	0.862	0.215	3.455	.835
Sources of FA information					
<i>Book</i>	.816	2.261	1.112	4.598	.024*
<i>General practitioner</i>	.501	1.650	0.662	4.114	.282
<i>Natural fertility teacher</i>	1.750	5.755	1.204	7.497	.028*
<i>Friend</i>	.502	1.652	0.630	4.333	.307
<i>Internet</i>	.797	2.219	0.986	4.995	.054
<i>IVF clinic</i>	.358	1.430	0.497	4.114	.507
Pregnancy intention categories					
<i>I have completed my family</i>	1.344	3.834	1.183	12.429	.025*
<i>I plan to have children in the future</i>	1.348	3.850	1.199	12.357	.023*
<i>I am currently planning a pregnancy</i>	1.019	2.770	0.742	10.341	.129
<i>I am currently pregnant</i>	1.342	3.827	1.087	13.468	.037*
Ever used ovulation prediction tests?					
<i>Yes</i>	1.591	4.909	2.695	8.942	<.001

Total sample size, $n = 328$.

* = significant p -value of < 0.05 .

4.2.3 Figures Presenting the Combined Findings of the Consumer Surveys

The main findings of the consumer surveys are combined and presented in the following figures for ease of comparison between the two consumer groups of this study.

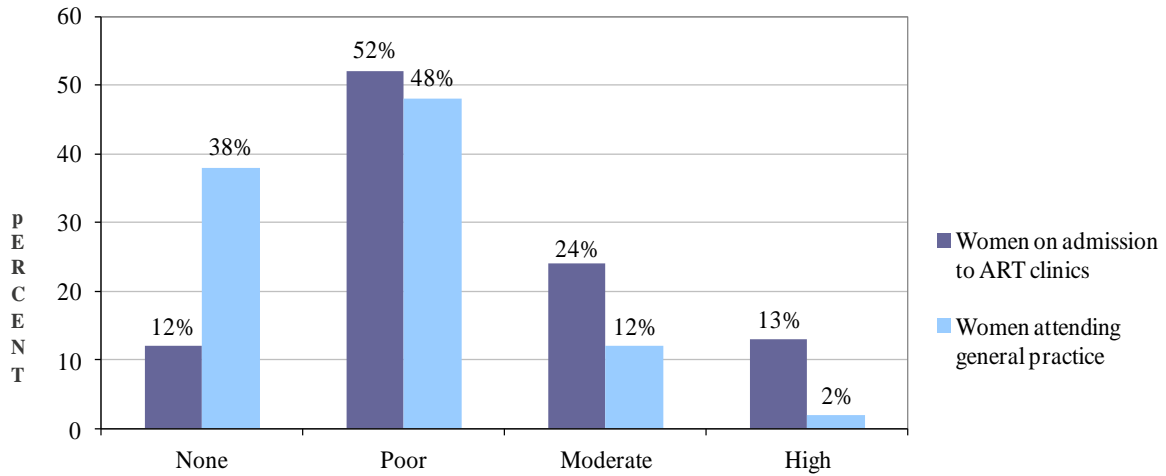


Figure 4.1 Percentage of women graded into one of four fertility-awareness categories

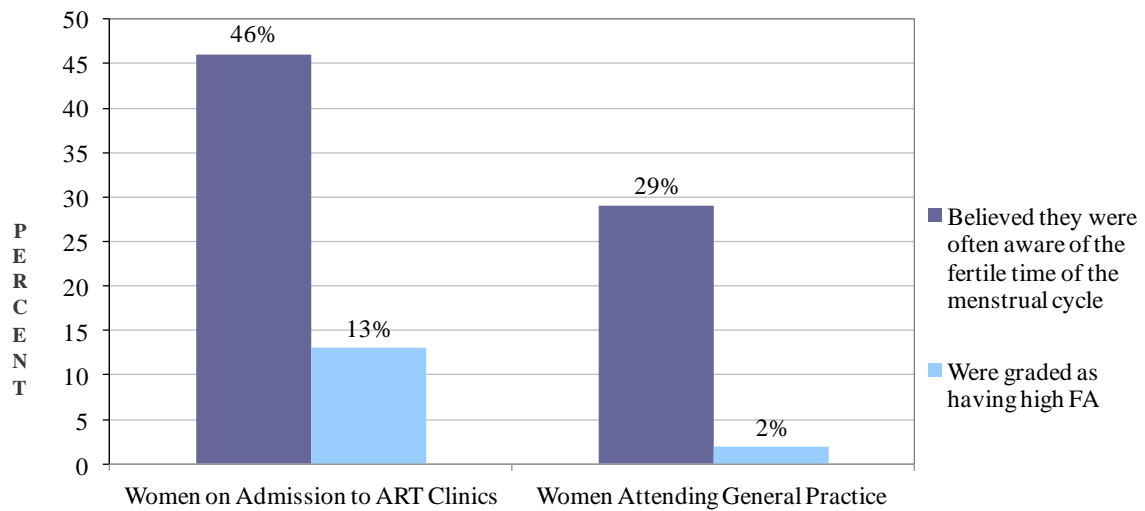


Figure 4.2 Comparing perceived fertility-awareness against actual fertility-awareness

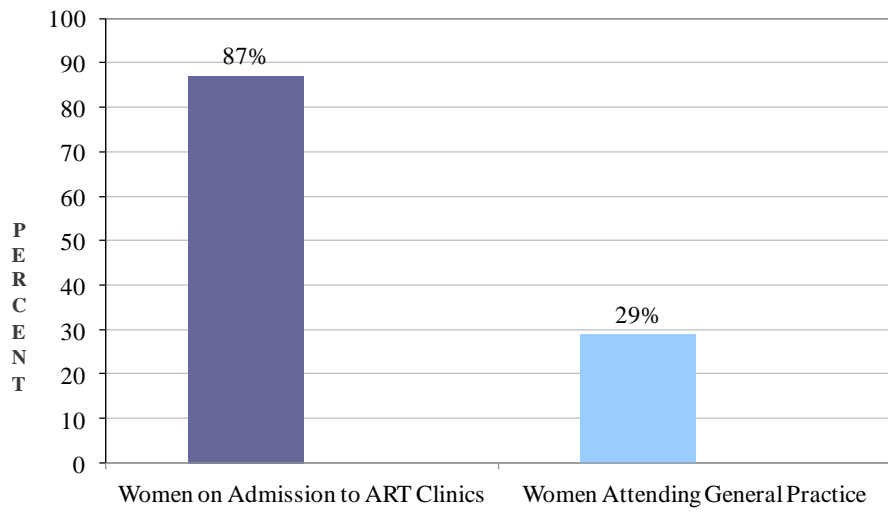


Figure 4.3 Actively tried to improve their understanding of fertility-awareness

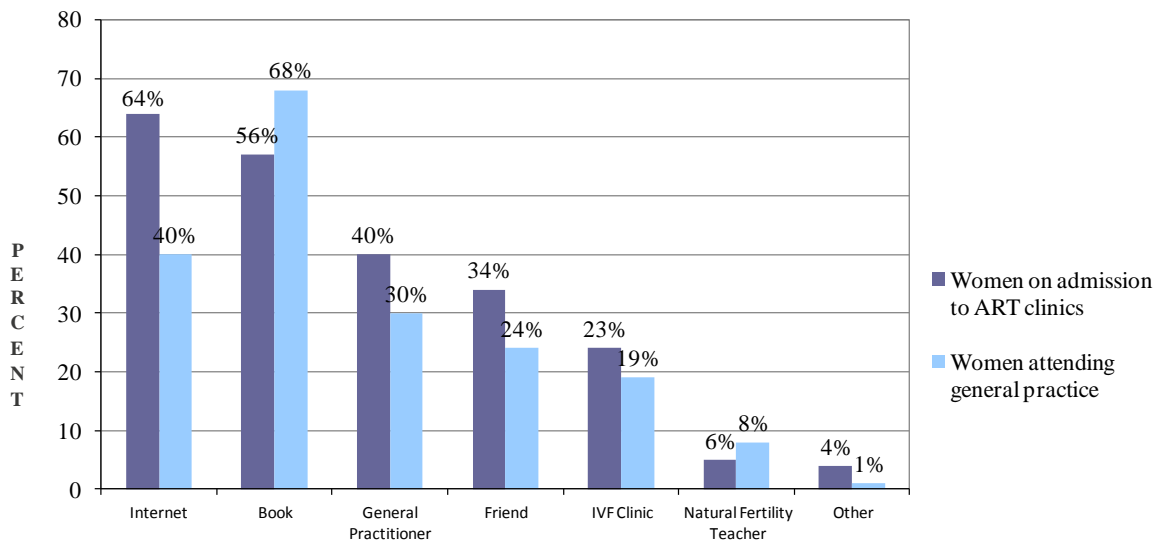


Figure 4.4 The sources of fertility-awareness information women had accessed

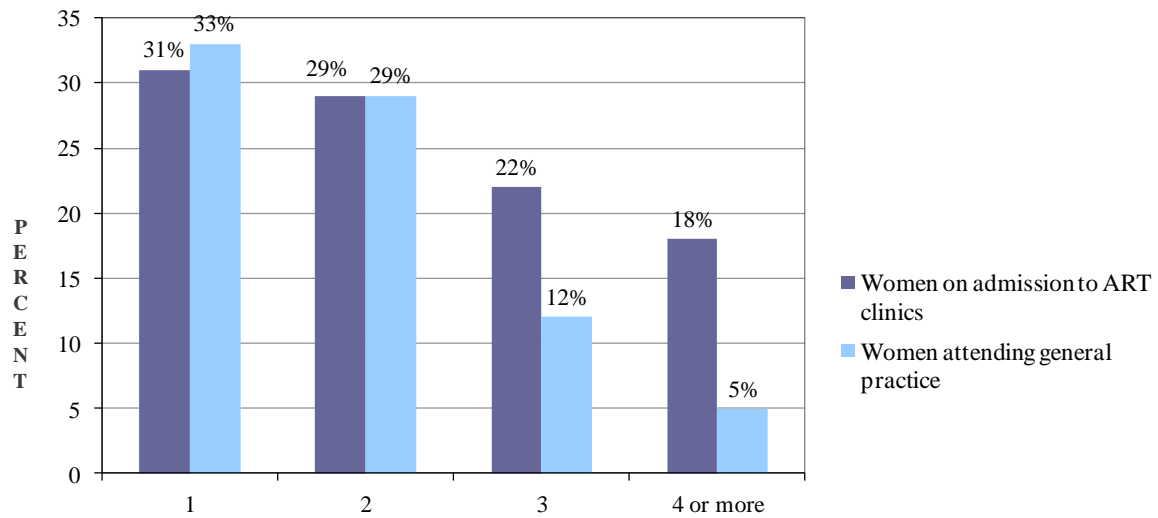


Figure 4.5 Number of sources of fertility-awareness information individual women had accessed

4.2.4 Analysis of the Consumer Survey Comments

The free-text comments offered in the consumer surveys of this study were combined and are reported as a whole. Ninety-two (17%) of the 532 returned questionnaires contained consumer comments. Inductive content analysis of the text data revealed four themes, which are presented below. These being: (1) This is knowledge all women should have; (2) Fertility-awareness education should be earlier; (3) My participation may help other infertile women; (4) I should know, but I don't. It's all so confusing

4.2.4.1 This is knowledge all women should have

Several respondents stated that FA knowledge was knowledge that all women should have. They believed that this knowledge was essential not only for effective family planning but also because it was essential to understanding their body and their health. These views are encapsulated in the following quotes:

“I think it’s really important to provide women with information about their bodies and their health. This information empowers women to take a more active role in their health and well-being.” (Woman attending general practice, High SES area)

“It is very good to know about your fertility from the beginning either to get pregnant and also how not to get pregnant. To know your body is also to be aware of your health.” (Woman attending ART clinic, Low SES area)

“I think this information should be conveyed to all females regardless of whether they are planning to [get] pregnant or not. [It’s a] good thing to know about.” (Woman attending general practice, High SES area)

“All women should be taught this for their own self-awareness, regardless of wanting to fall pregnant.” (Woman attending general practice, High SES area)

In keeping with the perceived importance of FA knowledge, several respondents stated that women should be educated about FA from the beginning of reproductive life. They believed that a better understanding of FA throughout reproductive life would help younger women to avoid unplanned pregnancy and older women to conceive naturally. To better support women to attain this knowledge from the beginning of reproductive life, they believed that the FA education should be taught as a part of girl’s secondary school education. These views are reflected in the following quotes:

“Natural fertility awareness should be introduced at schools. Unplanned pregnancies or young parent pregnancies may be reduced in incidence.” (Woman attending general practice, Rural area)

“More education will reduce the rate of unplanned pregnancy.” (Woman attending general practice, Rural area)

“Most women are unaware of their menstrual cycle and detecting when they are fertile. Women need to plot their cycles from [the] beginning of menstruation i.e., educate teenagers – this will increase body awareness and family planning for future.” (Woman attending general practice, High SES area)

“I am 22 years old...It would be helpful to know when I was fertile as an additional method to help prevent unwanted pregnancy.” (Woman attending general practice, High SES area)

“There is very little to no emphasis in high school or beyond on women’s ability to be aware of their cycle and thus control of their [own] fertility. It is assumed that oral contraceptives and condoms are the only effective methods.” (Woman attending general practice, High SES area)

To demonstrate the link between poor FA and unplanned pregnancy, several respondents offered their own real life stories. These women believed that their unplanned pregnancy could have been avoided had they had a better understanding of the fertile period of the menstrual cycle. These stories are presented as follows:

“I had to look into fertility times because I accidentally fell pregnant...I wasn’t aware that I had become fertile so close to my bleeding time.” (Woman attending general practice, High SES area)

“I became pregnant because I ovulated 2 weeks later than usual. [The] delay [was] caused from exclusive breastfeeding. We had successfully used [rhythm] timing in the cycle along with use of condoms & withdrawal for a period of five years...I now wish I knew other methods – temperature, mucous etc. This info could be offered at maternity wards – but only ever is pill info [given].” (Woman attending general practice, Rural area)

Several respondents stated that their interest in FA would greatly increase if they were actively planning pregnancy or having trouble conceiving. This strongly held belief led several other respondents to state that women should receive FA education when they first start “trying” rather than when they first report trouble conceiving to their GP, as highlighted in the following quotes:

“I was quite oblivious to mucus changes when I was in my teens and early 20s, and only paid attention to the changes when I wanted to get pregnant.” (Woman attending general practice, High SES area)

“Women should receive education about the fertile time in their menstrual cycle when they first start to try.” (Woman attending ART clinic, High SES area)

“If I was having trouble conceiving, then definitely I would be more aware of the different [types of] mucus. It’s like anything in life, unless it affects you directly you really don’t pay too much attention.” (Woman attending general practice, High SES area)

“I’m not planning to become pregnant just yet. I’ve never really thought about mucus changes and fertility in the cycle.” (Woman attending general practice, High SES area)

Beliefs concerning the importance of FA knowledge led several respondents to state that health practitioners should play a greater role in proactively educating women about FA.

4.2.4.2 Fertility-awareness education should be earlier

Across all three targeted SES areas in the consumer surveys – high, low and rural – respondents stated that women should receive FA education when first reporting trouble conceiving or earlier in certain circumstances when they first tell their GP that they are actively planning pregnancy. This belief is illustrated in the following quotes:

“I think women should be educated about their fertility and how best to get pregnant before they have trouble getting pregnant.” (Woman attending general practice, Rural SES area)

“Women should be more educated and aware of the fertility time when they first [start] trying [to conceive] or before. It wasn’t until I started charting etc. I was able to pinpoint there was an issue.” (Woman attending general practice, Low SES area)

“A woman should receive education to increase her awareness of the fertile time in the menstrual cycle when she first reports to her GP her difficulty in getting pregnant or beforehand when she has told her GP she is planning on trying [to conceive].” (Woman attending general practice, High SES area)

Feelings of frustration were shared by a number of respondents about the lack of timely or proactive support given by their GP concerning FA education, with several stating that the usual 12 month waiting period was too long when failing to conceive before any assistance was offered. This belief is expressed in the following quotes:

“I cannot stress the importance of educating women about fertility in general. I don’t quite understand the 12 month waiting period...I was 29 when we first started to try (thank-god I wasn’t in my late 30s). Unfortunately many women don’t have time on their side – more education would be of great assistance in understanding fertility. GPs need to take a role. I was told that 95% of couples conceive in the first 12 months [of trying]. For the 5% [that don’t conceive], 12 months is a long time before help can be reached.” (Woman attending general practice, High SES area)

“It has taken me 3½ years to work out my fertile times. This could have been considerably less if education was better, especially when we reported difficulty conceiving.” (Woman attending general practice, Rural area)

Several respondents also stated that they had received tertiary level fertility care, but had had been given no advise about the fertile period of the menstrual cycle, as illustrated in the following quotes:

“After trying to become pregnant naturally, [I] had to resort to IVF...Never considered the importance of mucus regarding fertility – [my] Dr didn’t discuss this [with me].” (Woman attending general practice, High SES area)

“I think more gynaecologists need to be proactive. Mine put me on the Clomiphene [a fertility enhancing drug] for 12 months without following up to tell me I don’t ovulate.” (Woman attending ART clinic, High SES area)

Several respondents stated that their GP neither advised them about FA, nor asked them about their understanding of fertile period of the menstrual cycle. They believed the reasons for these omissions were that GPs’ knowledge of FA was generally poor, and that there was a tendency among GPs to

falsely assume that women understand this aspect of their reproductive health, as the following quotes show:

“The knowledge of the average GP in this area is grossly inadequate.” (Woman attending ART clinic, High SES area)

“GPs need to ask the patient if they are aware of these changes...most GPs just assume [that because] we are female we know these things...I think the Doc’s should if they can’t give you the time of day refer you to a midwife. I had to go to the bookshop and buy a book...I was so disappointed in the lack of information...I guess [around] 80% of the female population know little about fertility and the GPs aren’t helping!” (Woman attending general practice, Rural area)

Rather than attaining FA information/education from their GP, several respondents stated that they sought and acquired the information from a number of other sources, namely the internet and books, as the following quotes show:

“I used the internet mainly to find out about these things. There was so much I didn’t know at first and was surprised how little my friends and family knew.” (Woman attending ART clinic, Low SES area)

“I tried [to get pregnant] for 10 years...We decided not to use assisted reproductive services. I read widely about fertile days etc...once I understood the cycle I was very aware of when I was fertile. It did make me think that this sort of info should be more widely/commonly available.” (Woman attending general practice, High SES area)

“I learned about my own body just by observing and reading and wanting to know how not to get pregnant before now.” (Woman attending ART clinic, High SES area)

“Most of the info I know I learned while doing admin work at a women’s health clinic.” (Woman attending ART clinic, Low SES area)

Women's beliefs about the importance of FA knowledge to family planning and general health appear to have contributed to their willingness to participate in the consumer surveys of this study with the hope of increasing women's access to this knowledge.

4.2.4.3 My participation may help other infertile women

Across all three targeted SES areas in these consumer surveys, respondents stated that they hoped their participation may lead to change increasing the accessibility of FA information/education for women in general, and especially for those who are having trouble conceiving. This belief is illustrated in the following quotes:

"I encourage your research and hope it can help others in the future to overcome their infertility [and] have a successful pregnancy." (Woman attending ART clinic, High SES area)

"I am glad someone is researching this. Women need to be educated from a young age about how their bodies and fertility works." (Woman attending ART clinic, Low SES area)

"I hope this survey can get this lack of information out there and [make it] accessible to all women." (Woman attending general practice, Rural area)

Despite strongly held views about the importance of FA knowledge, several respondents stated that they felt somewhat confused about this aspect of their health.

4.2.4.4 I should know, but I don't. It's all so confusing

Across all three targeted SES areas in these consumer surveys, respondents stated that their knowledge of FA was generally poor. Several also stated they would like to know more about FA and should know more about FA, but found the topic somewhat confusing, as the following quotes illustrate:

“I think there’s generally very little awareness about this topic among women.” (Woman attending general practice, High SES area)

“I am just not too sure about all this. I should know, but I don’t.” (Woman attending general practice, Low SES area)

“I am aware of the ‘normal’ days in a cycle that are fertile, but never saw any evidence of ovulation in my own body.” (Woman attending ART clinic, Low SES area)

“I would like to know when I am fertile – it’s all so confusing. I’m 28 and still don’t even understand my menstrual cycle.” (Woman attending general practice, High SES area)

“I am a 21 year old woman and wouldn’t have any idea [about fertility-awareness].” (Woman attending general practice, Rural area)

“I know the mucus type that indicates the fertile time, but I can’t identify it. The changes are hard to identify and aren’t the same each month.” (Woman attending ART clinic, High SES area)

“It would be good to be more informed so that we can plan our pregnancy because I don’t know about any of this.” (Woman attending general practice, Low SES area)

“The fertile days in my menstrual cycle are days 11,12,13,14,15,16,17, supposed to be 14, 15.” (Woman attending ART clinic, High SES area)

Despite the importance of FA and a desired to improve their knowledge, many women stated that they found the topic difficult to raise and discuss with others including their friends, family and health practitioner. Several stated that that they would like to be able raise and discuss the topic, but fear of embarrassing themselves and others made this difficult, as the following quotes show:

“It is difficult to discuss mucous etc. with other women as none in my generation were taught anything about the process of getting pregnant.” (Woman attending ART clinic, High SES area)

“Fertility issues are not talked about openly and many people find it hard or embarrassing to talk about [them].” (Woman attending ART clinic, High SES area)

“Due to a lack of female GPs I find it uncomfortable to talk about or ask questions about these sorts of issues.” (Woman attending general practice, Rural area)

“There is a discomfort among women in discussing the details of their cycle/mucus etc. It would be wonderful if some kind of cultural change could occur to make it easier.” (Woman attending general practice, High SES area)

Poor fertility knowledge among men and women appears to be contributing to their confusion about the meaning of the term ‘infertile’. Several respondents believed that ‘infertile’ meant no chance of conceiving naturally and, therefore, complete dependence on ART treatment for pregnancy, as the following quotes illustrate:

“They should keep trying, but if they are infertile then doesn’t that mean they cannot get pregnant naturally?” (Woman attending ART clinic, High SES area)

“By ‘infertile’, if you mean no success in 12 months but otherwise healthy and no problems. To my husband ‘infertile’ is an absolute term so he thinks I have ticked the wrong box.” (Woman attending ART clinic, High SES area)

Table 4.16 presents the code category, ranking and frequency of the themes identified in this analysis, highlighting the issues of importance that are upper most in the minds of women concerning FA knowledge and education in relation to this study.

Table 4.16 Code category, ranking and frequency of themes of the consumer surveys

Ranking	Categories	Code Count	Percentage	Theme Group
1	FA knowledge	44	49.9	This is knowledge all women should have
2	Health care experiences	18	20.2	Fertility-awareness education should be earlier
3	Comments supportive of FA education	14	15.9	My participation may help other infertile women
4	Barriers to FA education	11	12.2	I should know, but I don't. Its all so confusing

Note: The consumer surveys were combined and analysed as a whole. Total combined sample size, $n = 532$. Ninety-two (17%) of the 532 returned consumer surveys contained free-text comments.

4.3 Overview of Consumer Surveys

The findings of the consumer surveys of this study show that few women, whether they are seeking assisted conception treatment at ART clinics or attending general practice, understand the fertile window of the menstrual. This finding strongly suggests that women's poor knowledge of FA may be a contributing cause of both infertility and unplanned pregnancy. By contrast, most women in both consumer groups believe that women should receive FA education when first presenting in general practice with trouble conceiving. This finding suggests that women in general are aware of their limited fertility knowledge and also the importance of correctly timed intercourse for conception. The findings from the text data both complimented and strengthen those of the quantitative data by providing individual real life stories, personalising the meaning and importance of FA, not only to women's agency to achieve and avoid pregnancy but also to understanding their body and their health.

In the next section of the Results Chapter, the findings of Phase 2 of this study are presented: these being the findings of the review, the practitioner' survey, and the interviews and focus groups.

4.4 Phase 2

In this section of the Results Chapter the findings from the three sources of data collection utilised in Phase 2 are presented. It begins with the findings of the review, then presents those of the practitioner survey, and concludes with the interviews and focus groups. An overview of the combined findings of Phase 1 and Phase 2 of this study is presented before moving on to the Discussion Chapter.

4.4.1 The Comprehensive Review

Out of 142 abstracts that were retrieved, only one full-text guideline met the inclusion criteria and was reviewed further. The guideline, *Fertility: assessment and treatment for people with fertility problems* (National Institute for Clinical Excellence, 2004), was found on three different websites: two national clearing houses or guideline development Organizations (the United States National Guideline Clearing House and United Kingdom National Institute for Health and Clinical Evidence) and one health professional organisation (Royal College of Obstetricians and Gynaecologists (RCOG)). The comprehensive search of guidelines is presented in Table 4.17, and the flow chart of documents considered for this review is presented below in Figure 4.7.

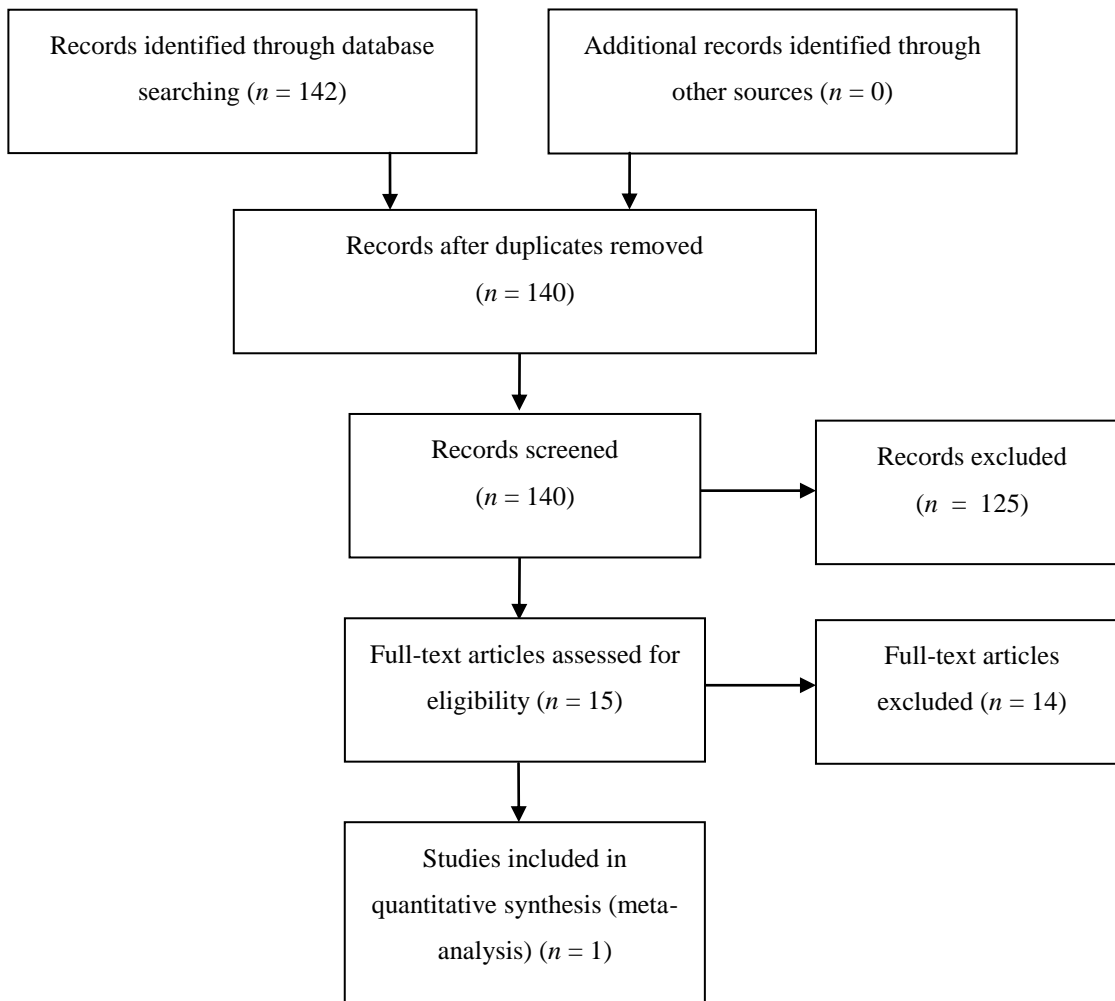
The NICE (2004) guideline states: “People who are concerned about their fertility should be informed that sexual intercourse every 2 to 3 days optimises the chance of pregnancy. Timing intercourse to coincide with ovulation causes stress and is not recommended” (National Institute for Clinical Excellence, 2004, p. 27). This recommendation is based on Kopitzke et al.’s study (1991) (level 3 evidence) that examined perceived stress levels in women in relation to infertility routines, procedures, medications and events, and is supported by six cohort studies (Bauman, 1981; Corson, 1986; Guermandi et al., 2001; Guida et al., 1999; Martinez et al., 1992; Templeton, 1982); (level 2b evidence) that evaluated the use of the temperature method and urinary luteinising hormone (LH) kits to time intercourse, but found no improvement in the chance of natural conception (National Institute for Clinical Excellence, 2004). Level 3 evidence is defined as a well designed non-

experimental descriptive study – such as comparative studies, correlation studies or case studies, and level 2b evidence is defined as at least one well-designed quasi-experimental study (National Institute for Clinical Excellence, 2004).

Table 4.17 Comprehensive search of guidelines

Sites	Accessed	Records Identified	Full-text Articles Accessed
National clearing houses or guideline development organizations			
<i>Australian Commission on Safety and Quality in Health Care</i> http://www.safetyandquality.gov.au	30/08/2010	0	0
<i>Department of Health And Ageing (Australia)</i> http://www.health.gov.au	30/08/2010	0	0
<i>MJA Clinical Guidelines</i> http://www.mja.com.au	30/08/2010	0	0
<i>New Zealand Guideline Group</i> http://www.nzgg.org.nz	30/08/2010	0	0
<i>NHMRC Clinical Practice Guideline Portal</i> http://www.clinicalguidelines.gov.au	30/08/2010	2	0
<i>Scottish Intercollegiate Guideline Network (SIGN)</i> http://www.sign.ac.uk	30/08/2010	0	0
<i>US National Guideline Clearing House</i> http://www.guideline.gov	30/08/2010	1	1
<i>UK National Institute for Health and Clinical Evidence</i> http://www.nice.org.uk	30/08/2010	1	1
Professional organizations			
<i>American Congress of Obstetricians and Gynaecologists (ACOG)</i> http://www.acog.org	30/08/2010	0	0
<i>American Society for Reproductive Medicine (ASRAM)</i> http://www.asrm.org	30/08/2010	2	0
<i>British Fertility Society</i> http://www.britishfertilitysociety.org.uk	30/08/2010	0	0
<i>Canadian Fertility and Andrology Society (CFAS)</i> http://www.cfasc.ca	30/08/2010	0	0
<i>Fertility Society of Australasia</i> http://www.fertilitysociety.com.au/anzica	30/08/2010	0	0
<i>International Federation of Fertility Societies</i> http://www.iffs-reproduction.org	30/08/2010	0	0
<i>Society of Obstetricians and Gynaecologists of Canada (SOGC)</i> http://www.sogc.org	30/08/2010	0	0
<i>Royal Australian College of General Practitioners (RACGP)</i> http://www.racgp.org.au	30/08/2010	30	5
<i>Royal College of Obstetricians and Gynaecologists (RCOG)</i> http://www.rcog.org.uk	30/08/2010	1	1
<i>Royal Women's Hospital</i> http://www.thewomens.org.au/ClinicalPracticeGuidelines	30/08/2010	0	0
Electronic data bases			
<i>Medline</i>	16/08/2010	21	7
<i>Scopus</i>	16/08/2010	24	
<i>Embase (basic search)</i>	16/08/2010	20	1
<i>Embase (advanced search)</i>	16/08/2010	40	2
Faculty of Family planning and Reproductive Health	16/08/2010	0	0

Figure 4.6 Flow chart of documents considered for the comprehensive review



4.4.2 Practitioner Survey

Completed questionnaires were received from 278 GPs and 473 PNs, providing a total sample size of 751 ($n = 751$). Although the minimum sample size for GPs ($n = 378$) was not achieved as determined by the sample size calculation, the response rate (27.8%) was similar to that obtained in other Australian GP surveys (Bonevski et al., 2011; Britt et al., 2010; Jones et al., 2012) and is considered adequate for meaningful analysis (Jones et al., 2012). The sample size for PNs ($n = 473$) was more than adequate, as determined by sample size calculations.

4.4.2.1 Socio-Demographic Characteristics

Table 4.18 presents the socio-demographic characteristics of GPs and PNs. Of the respondents, most were female (617; 82.3%), aged 45 years or older (499; 66.8%), and had received some education in FA methods in either their under- or post-graduate training courses (383; 51.2%). Practice nurses were more likely than GPs to be female (98.0% vs 42.2%) and less than 45 years of age (37.0% vs 29.0%).

Table 4.18 Socio-demographic characteristics of general practitioners' and practice nurses'

	N (%)	N (%)	Missing Data
	General Practitioners	Practice Nurses	
Gender			
Male	122 (42.2)	9 (1.9)	
Female	153 (55.4)	464 (98.0)	1GP
Age group			
Less than 35 years	20 (7.3)	54 (11.4)	
35-44 years	59 (21.5)	115 (24.3)	
45-54 years	92 (33.5)	200 (42.2)	
55-64 years	77 (28.1)	99 (20.9)	
65 years or older	26 (9.4)	5 (1.0)	3GPs
Had received some training in FA methods in either their under or post -graduate training courses	202 (72.6)	181 (38.2)	

Total sample size, $n = 751$.

General practitioner sample size, $n = 278$; Practice nurse sample size, $n = 473$.

4.4.2.2 Current Clinical Practice

Most (495; 82.7%) practitioners did not immediately refer infertile women who reported trouble conceiving on to ART clinics, and around half provided FA education (386; 55.5%), ordered blood tests for the woman (354; 54.9%) and a semen analysis for her partner (291; 46.0%). General practitioners were the most frequently recommended source of FA information and PNs were the least recommended source of FA information. Of the respondents who provided FA education, most was based on rhythm (56.6%) (see Table 4.19). Ordered logistic regression analysis revealed that PNs were significantly less likely than GPs to provide any of these clinical services with a p -value of <0.001 for each service (see Table 4.20).

Table 4.19 Fertility-awareness knowledge, attitudes and practices among general practitioners' and practice nurses'

	N	(%)	Missing Data
<i>What is your current practice when a woman presents in general practice who states she is having trouble conceiving?*</i> ^a			
<i>I order blood tests for the woman</i>	345	54.9	107
<i>I order a semen analysis for her partner</i>	291	47.0	132
<i>I immediately refer to a fertility specialist</i>	104	17.3	152
<i>I provide FA counselling</i>	387	55.5	53
<i>Other (lifestyle advise, taking a thorough history)</i>	17	2.3	
<i>If you do provide FA counselling, which of the following FA methods do you recommend?*</i> ^a			
<i>Rhythm</i>	386	56.5	70
<i>Mucus</i>	314	47.1	85
<i>Temperature</i>	241	37.0	99
<i>Other</i>	23	3.1	
<i>Which of the following sources of FA information do you recommend for women who are having trouble conceiving?*</i> ^a			
<i>I personally provide the instruction</i>	304	49.8	141
<i>I refer to a trained teacher</i>	186	32.1	171
<i>I recommend books or pamphlets</i>	283	46.6	123
<i>I recommend the internet</i>	125	20.4	187
<i>I refer to IVF clinics</i>	173	29.3	161
<i>I refer to a nurse with a special with a special interest in this area</i>	105	18.3	175
<i>I refer to a doctor with a special interest in this area</i>	223	48.9	93
<i>When accurately understood and applied, how effective do you think the following FA methods are in assisting women to conceive?*</i> ^b			
<i>Rhythm</i>	211	39.0	23
<i>Temperature</i>	185	25.7	31
<i>Mucus</i>	272	37.8	31
<i>Overall, how do you rate women's knowledge of the fertile time of the menstrual cycle?</i>			

<i>Low or very low</i>	301	40.1	
<i>Moderate</i>	388	51.7	
<i>High or very high</i>	62	8.2	
Overall, how do you rate your knowledge of FA methods?			
<i>Low or very low</i>	169	22.5	
<i>Moderate</i>	354	47.3	
<i>High or very high</i>	226	30.1	2
Timing sexual intercourse within the fertile time of the menstrual cycle can help some infertile couples to conceive.			
<i>Strongly agreed or agreed</i>	655	88.2	
<i>Undecided</i>	57	7.6	
<i>Disagreed or strongly disagreed</i>	24	3.2	8
FA education should be provided in general practice for couples who are having trouble conceiving.			
<i>Strongly agreed or agreed</i>	666	89.2	
<i>Undecided</i>	74	10.0	
<i>Disagreed or strongly disagreed</i>	14	1.9	4
A UK guideline for people with fertility problems states that “Timing intercourse to coincide with ovulation causes stress and is not recommended.”			
<i>Strongly agreed or agreed</i>	134	18.0	
<i>Undecided</i>	322	43.4	
<i>Disagreed or strongly disagreed</i>	286	38.5	8
In your undergraduate training did you receive any education about FA methods?			
<i>Yes</i>	383	51.2	
<i>No</i>	365	48.8	3
Would you like to learn more about FA methods?			
<i>Most definitely, definitely or probably</i>	539	72.4	
<i>Undecided</i>	99	13.3	
<i>Probably not, most probably not or definitely not</i>	106	14.3	7
Who do you think should provide FA for women who are having trouble conceiving?			
<i>Women’s health nurse or midwife</i>	209	40.8	
<i>Practice nurse</i>	189	36.9	
<i>General practitioner</i>	98	19.1	

Other (other included IVF clinics, obstetrician, community nurse and specialist nurse)

16

3.1

239

Total sample size, $n = 751$.

Numbers and per cent are presented as combined total of GPs and PNs.

*Note: More than one category could tick, therefore, numbers do not add up to the total number ($n = 751$) in several of the above categories.

Many PNs did not complete questions 1, 2 and 3, stating that they do not see people with fertility problems in general practice; thus, the high rates of missing data for these first three questions.

^a. Answer is based on the response of either always or usually.

^b. Answer is based on the response of either very high or high.

4.4.2.3 Fertility-Awareness Knowledge

Few (62; 8.2%) practitioners' rated women's overall knowledge of FA as either high or very high, and less than a third (226; 30.1%) rated their own overall knowledge of FA as either high or very high (see Table 4.20). Ordered logistic regression analysis revealed no statistical difference between GPs and PNs ratings of women's overall knowledge of FA. However, differences were noted in practitioners' ratings of their own overall knowledge of FA. Whilst PNs rated their knowledge of FA significantly lower than which GPs rated theirs' with a p -value of <0.001 , they were significantly more likely than GPs to believe that the temperature and mucus methods were more helpful than rhythm in assisting women to conceive with p -values of <0.001 for each method (see Table 4.20).

4.4.2.4 Attitudes to Fertility-Awareness Education

Consistent with the beliefs of most women in the consumer surveys, most GPs and PNs either agreed or strongly agreed that correctly timed intercourse within the fertile window of the menstrual cycle may help some infertile couples to conceive (655; 88.2%) and that FA education should be provided when women first present in general practice with trouble conceiving (666; 89.2%) (see Table 4.20). Only 18.1 per cent of GPs and PNs either agreed or strongly agreed with the NICE (2004) recommendation, which actively dissuades timed intercourse for conception (National Institute for Clinical Excellence, 2004). Ordered logistic regression analysis revealed no statistical difference in any of these attitudes to FA education for infertile women between GPs and PNs with p -values of >0.05 for each attitude (see Table 4.20).

In a further show of support for FA education in general practice, most GPs and PNs (539; 72.4%) indicating interest in undergoing professional development in FA methods (see Table 4.20). Ordered logistic regression analysis revealed that being a PN was associated with a higher level of interest in professional development in FA methods compared with GPs, but this factor was not statistically

significant, with a p -value of > 0.05 ($P = .403$) (see Table 4.20). However, when GPs and PNs were asked to nominate their most preferred practitioner group to provide FA, in descending order from the most preferred group, 48.8% nominated women's health nurses and midwives, 36.9% PNs, 19.1% GPs and 3.1% other (other included IVF clinics and obstetricians). These percentages do not add up to 100, as some practitioners nominated more than one practitioner group as the most preferred practitioner group to provide FA education.

Table 4.20 Comparing and contrasting fertility-awareness knowledge, practice and attitudes of general practitioners and practice nurses

	PN	OR	95%		Sig.
			LCL	UCL	
<i>What is your current practice when a woman presents in general practice who states she is having trouble conceiving?</i>					
<i>I order blood tests for the woman</i>	↓*	0.129	0.020	0.845	< .001
<i>I order a semen analysis for her partner</i>	↓*	0.097	0.065	0.145	< .001
<i>I immediately refer to a fertility specialist</i>	↓*	0.294	0.202	0.427	< .001
<i>I provide FA counselling</i>	↓*	0.303	0.211	0.436	< .001
<i>If you do provide FA counselling, which of the following FA methods do you recommend?</i>					
<i>Rhythm</i>	↓*	0.213	0.148	0.306	< .001
<i>Mucus</i>	↓*	0.545	0.385	0.771	< .001
<i>Temperature</i>	↓	0.809	0.570	1.149	.237
<i>From the list below, which of the following sources of FA information do you recommend for women who are having trouble conceiving?</i>					
<i>I personally provide FA instruction</i>	↓*	0.178	0.122	0.259	< .001
<i>I refer to trained teachers</i>	↑*	5.601	3.733	8.404	< .001
<i>I recommend books or pamphlets</i>	↑*	2.633	1.843	3.761	< .001
<i>I recommend the internet</i>	↓	0.801	0.556	1.153	.233
<i>I refer to IVF clinics</i>	↓*	0.544	0.379	0.780	< .001
<i>I refer to a nurse with an interest in this area</i>	↑*	4.968	3.234	7.631	< .001
<i>I refer to a doctor with an interest in this area</i>	↑*	9.786	6.626	14.455	< .001
<i>When accurately understood and applied, how effective do you think the following FA methods are in assisting women to conceive?</i>					
<i>Rhythm</i>	↓	0.765	0.539	1.086	.134
<i>Mucus</i>	↑*	1.844	1.306	2.604	< .001
<i>Temperature</i>	↑*	1.774	1.246	2.524	< .001
<i>Overall, how do you rate women's knowledge of the fertile time of the menstrual cycle?</i>	↑	1.186	0.832	1.692	.346
<i>Overall, how do you rate your knowledge of FA methods?</i>	↓*	0.379	1.321	-.618	< .001
<i>Timing sexual intercourse within the fertile time of the menstrual cycle may help some infertile couples to conceive.</i>	↓	0.708	-.717	.026	.069
<i>FA education should be provided in general practice for couples who are having trouble conceiving</i>	↑	1.334	-.067	.643	.112
<i>Would you like to learn more about FA methods?</i>	↑	1.328	0.267	0.538	.403

Total sample size, $n = 751$.

General practitioners are the comparison group.

↓ = Less likely than a GP.

↑ = More likely than a GP.

* = Significant p -value of < 0.05 .

4.4.2.4.1 Attitudes to Fertility-Awareness in Women and PHC Practitioners

Figure 4.6 compares attitudes to FA education in women and PHC practitioners, highlighting that a high degree of agreement exists between women and PHC practitioners that women should receive FA education in general practice when presenting with trouble conceiving.

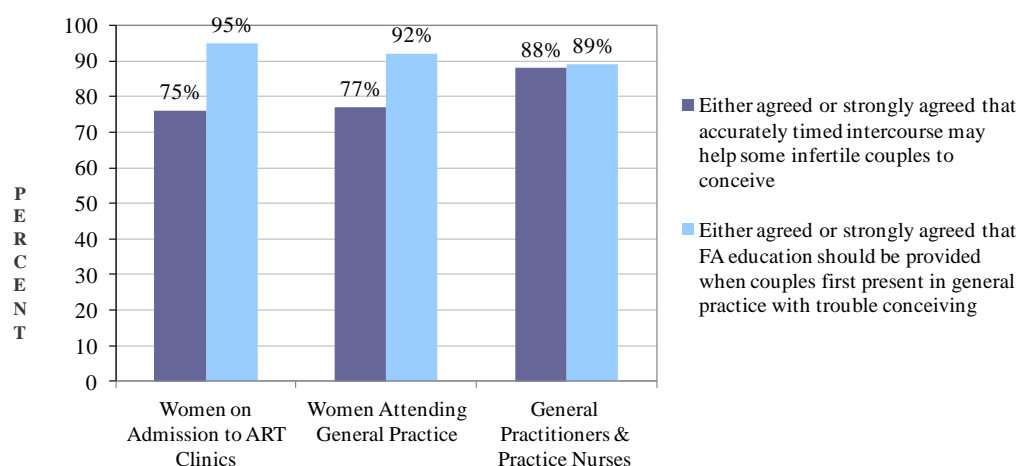


Figure 4.7 Attitudes to fertility-awareness education for infertile women

4.4.2.5 Analysis of Survey Comments

One hundred and thirteen (15%) of the 751 returned practitioner questionnaires contained free-text comments. Inductive content analysis of the text data revealed four themes, which are presented below. These being: (1) Current clinical practices in fertility-awareness education; (2) Lack of knowledge and skills; (3) Role and professional development in practice nursing; (4) Women's knowledge of fertility-awareness is generally very poor

4.4.2.5.1 Current clinical practices in fertility-awareness education

Three very different clinical practices were described in relation to FA education in general practice by GPs and PNs. Amongst GPs, on the one hand, several stated that they generally referred women who are having trouble conceiving to ART clinics where they believed they would get all the necessary information and advice. On the other hand, several GPs stated that they usually provided FA education for women who are having trouble conceiving and generally with positive results. These contrasting practices may be explained by the GP's gender, as illustrated in the following quotes:

"We have a number of IVF clinics available and looking for work. I'm sure they would be the best place for people to gain education and fertility treatment." (GP, male)

"I leave it to the experts [IVF clinics] due to lack of knowledge, time constraints and high expectations by consumers." (GP, male)

In contrast to this belief, several other GPs did not believe that FA education was offered as a treatment option in ART clinics, as shown the following quotes:

"I spent 6 months in an O&G [Obstetrician and Gynaecologist] job in the UK with a fertility consultant and these issues were never discussed. Interesting!" (GP, male)

"The IVF specialist I use have not mentioned temp or mucus methods at any in-services we've attended in last 5 years." (GP, male)

Several female GPs stated that they usually provided FA education when women presented with having trouble conceiving, and that many women had conceived as a result of FA education, as the following quotes illustrate:

"I have seen positive results with giving this education." (GP, female)

"I think it is easily explained and I have certainly seen people become pregnant quite soon after having told when they are most fertile." (GP, female)

“With education and allowing them 1 year to try is usually successful. Temperatures and charts are the best guide, and advising sex for 4 to 5 days prior to ovulation.” (GP, female)

For reasons relating to a lack of time, expertise and resources, several GPs stated that they referred their patients to NFP services or websites rather than personally providing FA education themselves, as the following quotes show.

“A fertility counsellor would be better as they would do it better and spend longer.” (GP)

“Whilst I am familiar with natural family planning, I am not confident advising couples. I usually refer to online/CDROM resources when doing so, to jog my memory and ensure I give correct advice.” (GP)

“I often refer women to the Natural Family Planning Centre, as they have the time and resources to explain this in detail.” (GP)

Practice nurses stated that they had little opportunity to provide FA education for women who are having trouble conceiving, as most people who report trouble conceiving in general practice are seen by GPs, not PNs, as the following quotes illustrate:

“Couples having trouble conceiving are seen by the GP in my Practice.” (PN)

“People tend to discuss this with their GP.” (PN)

“Practice nurses don't have [the] opportunity to discuss with patients their fertility issues.” (PN)

“Our GPs tend to handle this.” (PN)

Despite these different clinical practice responses among GPs and PNs, there was general agreement between these practitioners about the main barriers to FA education in general practice.

4.4.2.5.2 Lack of knowledge and skills

Several GPs and PNs stated that the main barriers to FA education in general practice were a lack of knowledge and skills among GPs and PNs in FA methods, as the following quotes show:

“My medical training gave no FA training, but I have learnt about FA and practiced it myself.” (GP)

“With shorter and shorter UNI Medical Courses – there is less time to teach students the basics.” (GP)

“[This] should be taught to GPs – emphasis on IVF/referrals to specialists/blood tests have got GPs and patients away from the basics (similar to diets and drug remedies for obesity instead on ‘common sense’ – eat less and exercise more.” (GP)

“What we learnt in our training is not enough. An update on this subject would be helpful.” (PN)

“I really don't know very much about this area.” (PN)

“In general RN training there is practically no training in sexual and fertility health, this should become part of the curriculum, as there are so many different times in nursing that this information can become useful.” (PN)

Several PNs stated that they did not provide FA education as it falls outside their current scope of practice. However, several PNs also stated that FA education was important in the primary care of infertile women and that this could be a new role for nurses.

4.4.2.5.3 Role and professional development in practice nursing

Several PNs stated that FA education should be actively promoted in the primary care of infertile couples as it may help some couples to conceive, and that FA education was particularly suited to nursing practice as nurses can generally spend more time educating patients, as following quotes illustrate:

“Fertility awareness is an area that can assist couples in successfully falling pregnant. I believe that this is a subject that should be promoted more.” (PN)

“I think it [FA education] would be an appropriate area for the practice nurse to be trained in as we are often able to spend more time with the patients on education.” (PN)

“I feel the initial first stages of infertility counselling could be attended by a practice nurse who would have more time to assist partners and could reduce the expense travelling to infertility clinics. After initial testing and methods are trialled, if there are continuing problems couples could then be referred to fertility clinics with results of tests and trials, thus reducing expense to couple and the overfilling of fertility clinics. The practice nurse could work with the fertility clinics for some of the follow-up to reduce costs of travel especially for country couples (if nurse was trained this could assist the specialist and also give support on a local level to the couple).” (PN)

“Infertility can become a focus of couples and have a marked effect on their relationship. Being able to support them in general practice can assist in increasing knowledge and reduce the need for the highly interventional areas of Reproductive Technology which are important, but should be reserved when all other options have been exhausted. Sometimes the pressures of trying to conceive are overwhelming for a couple when it does not happen in the time frame they consider appropriate. Support in general practice is essential in the first instance to provide education and information. Support from people who are genuinely interested in fertility support is the key.” (PN)

However, PNs believed that before they can take up a role in this field of clinical practice, they should first undergo a program of education and that professional development in this field of practice could be led by the Divisions of General Practice, as the following quotes illustrate:

“Certified training would be needed if practice nurses undertook counselling [in this area]. (PN)

“I think practice nurses are well placed to give [this] information, but we definitely need much more education in this area before this can be done.” (PN)

“FA is very personal and sensitive issue – Counselling needs to be with adequate appointment time, from appropriately qualified professionals with either a special interest, or specialise in this area to ensure accurate assessment occurs with minimum stress and delay.” (PN)

“The professional development could be a nurse/division led incentive course.” (PN)

Practice nurses also believed that before they could translate professional development in FA education into clinical practice they would first need the support of the practice management, as the following quote illustrates:

“It also must be remembered that the time to do counselling has to be supported by practice management.” (PN)

Several GPs and PNs stated that they believed that women’s overall knowledge of FA was poor.

4.4.2.5.4 Women’s knowledge of fertility-awareness is generally very poor

Several GPs and PNs stated that they believed that women’s overall knowledge of FA was generally very poor. No contrary view to this effect was stated. This generally held belief is encapsulated in the following quotes:

“I think women in general have little idea of the signs of fertility.” (GP)

“I find that couples are not always aware of ideal time for fertilisation.” (GP)

Table 4.21 presents the code category, ranking and frequency of the themes identified in this analysis, highlighting the issues of importance or greatest concern in the minds of GPs and PNs in relation to FA education for women who present in general practice with trouble conceiving.

Table 4.21 Code category, ranking and frequency of themes of the practitioner survey

Ranking	Categories	Code Count	Percentage	Theme Group
1	GPs' and PNs' practices	58	51.3	Current clinical practices in fertility-awareness education
3	Beliefs about prevention	31	27.4	Lack of knowledge and skills
2	Knowledge and skills	30	26.5	Role and professional development in practice nursing
4	Women's knowledge	14	12.3	Women's knowledge of fertility-awareness is generally very poor

Total sample size, $n = 751$. One hundred and thirteen (15%) of the 751 returned practitioner surveys contained free-text comments.

4.4.2.6 Overview of Practitioner Survey

The findings of the practitioner survey show that most GPs and PNs are aware of women's overall low level of knowledge of FA, and strongly believe that FA education should be provided when women first report trouble conceiving. Most FA education in general practice is currently provided by GPs but is not based on the best available evidence. Contrary to current practice, most GPs and PNs believe that nurses and midwives are the most preferred practitioner group to provide FA education. The findings of the text data extend those of the quantitative data, revealing positive attitudes to FA education among PNs with a very strong interest among these practitioners in taking up a role in this field of practice. This is the first account of such a positive response amongst this group of health practitioner.

The findings of the practitioner survey and all previous investigations of this study to this point helped to refine the question schedule based on Michie et al.s' (2005) behaviour change framework that was used in the interviews and focus groups.

4.4.3 Practitioner Interviews and Focus Groups

Deductive content analysis of the interviews and focus groups revealed six themes that influence FA education in general practice. These themes are discussed below and resonate with seven of Michie et al.'s (2005) theoretical behaviour change domains: (1) environmental context and resources, (2) social/professional role and identity, (3) knowledge, (4) skills, (5) behavioural regulation, (6) domain of memory, attention and decision processes (7) emotion. There was substantial overlap in content in the domains of knowledge and skills, therefore, these domains were combined and reported as one.

The themes are: (1) Lack of everyday resources; (2) Prevention in health care; (3) Not skilled enough (4) Practice options for fertility-awareness education; (5) Medical dominance; (6) The personal 'nature' of the topic.

Interviews were undertaken with 11 GPs (5 male and 6 female) and focus groups were undertaken with 20 PNs (all female in 3 face-to-face focus groups with 5-8 participants in each group). Nine participants (4 GPs and 5 PNs) were from practices in a high SES area, 10 (3 GPs and 7 PNs) were from practices in a low SES area and 12 (4 GPs and 8 PNs) were from practices in a rural mid-range SES area, providing fairly even representation across the three targeted SES areas of this qualitative phase.

4.4.3.1 Setting the Scene

To set the scene, at the beginning of each interview participants were asked for their understanding of the term 'fertility-awareness'. Surprisingly, GPs and PNs interpreted the term 'fertility-awareness' in various ways, and definitions ranged from knowing where to refer infertile people for specialist care through to the generally accepted definition in family planning discourse (Pallone & Bergus, 2009). Of the participants, female GPs were more likely to understand this term than male GPs and PNs. The lack of a standard shared definition of NFP among health practitioners for the purposes of teaching

women about NFP methods has also been shown in the United States (Kelly et al., 2012). After this brief introductory exercise, FA was defined for the purposes of the interview schedule.

4.4.3.2 Lack of everyday resources

Consistently across all interviews, GPs and PNs believed that resources, such as a lack of time, educational materials and remuneration, were major barriers to FA education in general practice. These sub-themes reflect Michie et al.'s (2005) domain of environmental context and resources (Domain 8). Each is described separately as follows.

Lack of time

Of the mainly female GPs who provided FA education, several shared that short consultations made it difficult for them to either initiate a discussion on the topic or provide anything other than basic instruction when the information was specifically requested. In addition, several participants also shared that women typically did not make appointments solely for the purpose of FA education, but rather sought the information out within the context of other appointments, such as having a Pap test, when no spare time was available. This strongly held belief is represented in the following interview quotes:

“Often you have only 10 or 15 minutes and the fertility issue is [a] very complex area so 15 minutes is not enough to cover very much, and it’s not just us not having time but a lot of the time patients don’t have the time. They come in with a list of things or they’re in a hurry, so I think both parties don’t have the time.” (Female GP, Low SES area)

“Difficulty is almost always time. It’s not an isolated conversation. They throw it in at the end of a Pap-smear...it’s very hard to get them to give you enough time.” (Female GP, High SES area)

Several female GPs shared that the preconception health check was the ideal time to initiate a discussion on FA education, as it may help some women avoid difficulty conceiving. However, the

inclusion of FA education within the preconception health check was considered problematic for two reasons. First, because many women do not attend this health check; and, second, because there is no spare time within this health check for the provision of additional services, as the following interview excerpts illustrate:

“So often the first time we see them is when they perceive a problem with conceiving. So if women were aware that they needed to come in for a health check and blood test before actively trying that would provide an opportunity to discuss those kinds of things then.”
(Female GP, High SES area)

“[in the pre-conception health check there] is so much to cover...folic acid and vitamin D and rubella and cystic fibrosis...I think it’s hard to fit it all in.” (Female GP, High SES area)

Clinical practice time constraints combined with the belief that FA education was time consuming led several GPs to share that FA education was typically only provided when specifically requested. The following quotes reflect this belief:

“I would say your average GP would wait until the topic’s brought up, because they’re busy, he hasn’t got the time to initiate the conversation...So I think most of the time they wait for someone to talk to them [about it]. I think even if someone’s coming in for fertility issue, sometimes it’s one of the last things you end up talking about...because there is so much to do.”(Female GP, High SES area)

“...as a subject...we think that it is very straight forward and simple, but it’s quite a complicated thing to explain to someone who’s not got their head around the idea of the cycles and things, especially if their cycle’s irregular” (Female GP, High SES area)

Across all focus groups, PNs shared that short GP consultations were a major reason for women being referred to specialists often prematurely and without having demonstrated an actual need to see a specialist, as the following interview excerpts highlight:

“I’d say some of my GP’s avoid it and just refer off straight away without even probably conducting any of their own tests, it’s probably easier just to send them [off] straight away.”
(PN, High SES area)

“Sometimes...my doctors disappoint me by just shuffling people off to IVF specialists when you know they don't understand...when they are fertile...It disappoints me because...you know some people just need that education and the doctor just doesn't have the time to do that in his 10 minute consultation.” (PN, High SES area)

Lack of educational materials

After a lack of time, a lack of educational materials was the next most frequently mentioned environmental barrier to FA education in general practice. There was a shared belief among GPs and PNs that concise, evidence-informed and up-to-date materials were needed to guide FA education in general practice. These materials were considered important for both women and health practitioners alike, and were especially important for practitioners who provided FA education only occasionally. Both GPs and PNs believed that the materials should be conveniently stored and readily available (that is, downloadable from their computer). These beliefs are demonstrated in the following interview excerpts:

“One more thing that may help increase confidence is having appropriate written material so I could read, work through the written material and then give that to patients...If it’s only once every two months that this subject comes up then you don’t have as much confidence ‘cause it’s not something you are fully aware of.” (Female GP, Low SES area)

“It would be good to give them something that they can take away and then come back to you if they’ve got the questions or they want more detail or something like that.” (PN, Low SES area)

“I think information, like...pamphlets...because, again, it’s a big discussion and often people may not remember everything that’s said. So if you can discuss it and then give people

something to take away they can read and reinforce and refer to it, I think that's ideal.”
(Female GP, Low SES area)

Lack of remuneration

A lack of remuneration was the third most frequently mentioned environmental barrier to FA education in general practice. Both GPs and PNs characterised general practice as small businesses that were dependent on income generating tasks for their sustainability. Without dedicated funding from Medicare for GPs or PNs to provide FA education, it was considered virtually impossible to allocate the necessary time, as the following illustrate:

“Remuneration is important because of the way general practice is structured. So...remuneration...would definitely help.” (Female GP, Low SES area)

“In general practice...unless there's somebody there that's got an interest, a real interest [then] it gets swept [under the carpet]...because there doesn't seem to be the money to be made out of that area.” (PN, Rural area)

From the patients' point of view, several PNs believed that women may not be able to afford the costs of FA education by GPs because it would require long a consultation and may involve several appointments, as the following interview quotes highlight:

“A couple of our doctors are very strict on their appointment time and will say, look I'm sorry, I can't discuss that with you, you need to make another appointment. Make a double appointment next time. But I kind of think sometimes then that might have put you off of not wanting to come back.” (PN, High SES area)

“Affordability is an issue for a lot of our patients.” (PN, High SES area)

Despite these barriers, GPs (mainly female GPs) and PNs believed that FA education should be provided in the primary care of infertile women in general practice.

4.4.3.3 Prevention in health care

There was a shared belief among GPs and PNs that prevention in health care was a critical aspect of general practice and that these activities should be aligned to meet the needs of their community. This theme reflects Michie et al.'s (2005) domain of social/professional role and identity (Self-Standards) (Domain 3). It centres on the participants' belief that they have a professional role and responsibility in promoting prevention in health care. Both practitioner groups, especially female GPs and PNs, believed that FA education should be actively promoted in the initial care and treatment of infertile women as it may help some to conceive, as the following interview quotes highlight:

“We need to be able advise patients when to have more intercourse. We need to know the risk factors that lead to sub-fertility or infertility as in obesity, drugs or alcohol. We need to...be able to address that for the patients....Maybe 50 percent will be fine after that and conceive. So basically general wellbeing [and] ...holistic management....because often it's a social thing. If they change their social lifestyle their fertility may come back very quickly...it's not always that they need to go down the IVF pathway.” (Female GP, Low SES area)

“There's lots of self-management in general practice now around chronic disease but you know there's no reason why that can't be translated into well women's health.” (PN, Rural area)

Despite strongly held views about the role general practice could play in prevention in the initial care and treatment of infertile people, most GPs and PNs also shared that they lacked the necessary knowledge and skills to provide FA education.

4.4.3.4 Not skilled enough

This theme centres on participants' concerns that they do not have the necessary knowledge or skills to provide FA education because of a lack of education and training in their under-graduate training courses. These concerns reflect Michie et al.'s (2005) domains of knowledge and skills (Domain 1 and Domain 2, respectively). Across all interviews there was general agreement that professional development in FA methods was needed to improve the delivery of FA education in general practice. Although this theme was strongly represented among both practitioner groups, some important differences were noted. General practitioners were more likely than PNs to have had some training in FA methods, and female GPs were more likely than male GPs to provide at least some instruction on their use. These different perspectives are captured in the quotes below and reflect the theme 'Not skilled enough':

"They [GPs] need the knowledge to give the right advice...it's not something that you really get much education about." (Female GP, High SES area)

"I'm not confident in the subject. My knowledge around fertility is pretty minimal." (PN, Rural area)

Without exception, female GPs shared that they have sufficient FA knowledge to provide only basic information on FA methods, and if any detailed information was required they indicated this was beyond their skill level, as the following interview excerpts have captured:

"I think I can provide some [FA education] but if I was to do it properly I would probably need to do a refresher course." (Female GP, Low SES area)

"I feel confident enough that I could provide the basic first steps and if it gets more complicated...I have been referring my patients to a gynaecologist." (Female GP, High SES area)

In contrast, most male GPs shared that they did not attempt FA education as they believed they did not have the requisite knowledge or skills and, therefore, referred infertile women to specialists instead, where they believed they would get all the necessary correct information and advice. The following quotes illustrate this particular male perspective on FA education:

“The GP themselves feeling that they don’t have the knowledge to provide that type of advice or counselling so they’re not going to launch in on it because they don’t feel confident themselves.” (Male GP, Rural area)

“I’m not very familiar with the area...barriers to providing that advice would be not being qualified to offer specific advice to patients. For instance if I referred them to IVF programmes...I know that they’re going to get quality advice right up to the point of intervention and conceiving...I can offer general advice, general screening tests and have to refer.” (Male GP, High SES area)

Consistently, across all focus groups, PNs stated that they did not provide FA education as it did not fall into their current scope of practice. Their views are encapsulated in the following comment:

“You can’t presume that nurses have education on this subject” (PN, High SES area)

When the participants were asked about what steps could be put in place to improve the delivery of FA education in general practice, they presented a range of practice options.

4.4.3.5 Practice options for fertility-awareness education

Although GPs, especially female GPs, and PNs shared that either practitioner group should be able to provide FA education, there was general agreement that specially trained nurses working within a collaborative team care arrangement with GPs was ideal for several reasons. This theme reflects Michie et al.’s (2005) domain of behavioural regulation (Domain 11). It centres on the participants’ belief that greater use of specially trained PNs was necessary to improve both the quality and

accessibility of FA education in general practice. Diabetes education and chronic disease management were offered as examples by both practitioner groups as successful collaborative team care arrangements on which FA education could be based, as the following interview quotes illustrate:

“It’s like diabetes is now considered multidisciplinary care so I think fertility should start to come into that area...you’d almost maybe need a separate nurse that might have speciality in chronic disease or certain issues.” (Female GP, Low SES area)

“I think to improve the availability of this sort of information for women you probably need somebody like a Practice Nurse who has hopefully a little bit more time available to be up skilled in the delivery of this type of education.” (Male GP, Rural area)

“I think having staff that are dedicated to explain this sort of thing, I think it’s a big enough area that you almost need to have a staff member who can sit down for 20 minutes, half an hour and just explain carefully what it is that you want patients to [understand]...” (PN, High SES area)

“I think you create an environment where you actually have some time to go over that, so that the women don’t feel rushed, and explain just in simple terms, so simple wording will make it easier to understand. Obviously, I think it would be difficult if there be language barriers or cultural barriers.” (Female GP, Rural area)

In practices that see few women of reproductive age, several PNs suggested that alternative arrangements could be made, such as referring women to local well women’s health clinics or having a nurse specialist in FA education visiting the practice, as currently happens in some practices in diabetes education. This belief is highlighted as follows:

“In a busy general practice environment, you don’t have the time to get bogged down in the laborious conversations...if it’s not your field and it doesn’t just come off the top of your tongue...you need to be a good delegator to people who do know what they’re talking about.” (PN, Rural area)

“In our clinic we have visiting diabetic nurses and visiting asthma nurses...so it would be nice to have a visiting fertility nurse...that’s another way of bringing it into the general practice arena.” (PN, High SES area)

Across all focus groups, PNs believed that with appropriate education and training they could take up a role in FA education, and being a mostly female profession would afford several advantages in bridging a number of barriers in the delivery of FA education in general practice, as the following interview quotes represent:

“I think this is traditionally a nurse’s field. If you think of Family Planning, I mean fertility awareness in terms of contraception was always taught by nurses, public health nurses...so it's actually quite nurse orientated.” (PN, High SES area)

“If some of the doctors don’t feel comfortable talking about it [FA] with their patients...if there’s a female nurse...people might feel more comfortable. The patients might feel more comfortable and the doctor might feel like they’ve been able to provide the advice without doing it personally.” (PN, High SES area)

“...maybe they’d [GPs would] feel more comfortable if the patient would be referred to someone like the practice nurse. I think it’s something that we should be able to deal with” (PN, Rural area)

“I think...to have the information there for the doctors to point the patient in the right direction and if that means coming to see me or going to see another doctor... instead of them going...I don't know anything, I'll send them off to this big specialist that they might not even need to go to.” (PN, High SES area)

However, there was general agreement among GPs and PNs that before PNs could take up a role in FA education they should first undergo a program of training. General practitioners believed that this was necessary for them to have confidence in referring infertile women to PNs and, similarly, PNs believed that they would be well utilised by GPs if GPs knew they were appropriately qualified in the delivery of FA education, as the following interview quotes illustrate:

“It’s a matter of making sure [the] Practice Nurse has accurate, up to date information...is providing the same sort of information you would...preferably resourced with the most appropriate handout, pamphlets, that can be printed from the computer and then allowing them to venture into that area of advice and counselling.” (Male GP, Rural area)

“I think practice nurses would be ideally trained up to do a pre-pregnancy counselling interview but the training would need to be there, the package would need to be developed.” (Female GP, High SES area)

“I think you have to educate nurses like...online training...like a certificate...[and] once the doctor knows that the nurse is trained, they’ll often utilise the nurse for [the] education.” (PN, High SES area)

“We need the tools; we need a kit...so that it’s...fairly straightforward...[and] everyone’s educated the same, and we’re all giving the same information.” (PN, Low SES area)

To promote the uptake of FA education in general practice by PNs, there was a shared belief among both GPs and PNs that patients will need educating about the availability of this new service by PNs, as the following interview quotes reflect:

“...posters and educational pamphlets can be made available in the clinic so patients will see it and it may just let them know that yes we deal with it [FA education] ...in this clinic. Or it may just jog their memory and they may go oh yes I’ve got to ask my doctor about my fertility as well.” (Female GP, High SES area)

“Just an opening for people to ask the questions...like posters or something to make people aware that you are open to be talked to about those things...and it is an option to talk to the nurse.” (PN, Low SES area)

“Then they [PNs] need to be advertised as a service within the practice, so whether it’s a newsletter or a poster, a pamphlet or word of mouth which works remarkably well in small, rural communities. You make it known that your Practice Nurse can provide this type of educational service and once the process gets up and running I think you’ll find that it sort of, it generates its own workload.” (Male GP, Rural area)

General practitioners and PNs believed that medical dominance was a major barrier to implementing these practice options to improve the delivery of FA education in general practice, as the following theme highlights.

4.4.3.6 Medical dominance

Across all interviews GPs and PNs shared that compared with referrals to ART clinics FA education was rarely offered to women who reported trouble conceiving. This theme reflects ‘decision processes’ in Michie et al.’s (2005) domain of memory, attention and decision processes (Domain 7). It centres on the participants’ belief that processes and systems are well established in general practice for referring infertile women to ART clinics, but not for FA education. This was exemplified by the fact that even the term ‘fertility-awareness’ was poorly understood by most GPs and PNs in the introductory phase of the interviews, as the following interview quotes highlight:

“When I hear “fertility awareness” I’m not sure really...I don’t really have an understanding of it at all.” (PN, Low SES area)

“I don’t know how to classify it [FA] but I think a really good starting point...would [be] for it to be a widely recognised term so that doctors know what’s involved.” (Female GP, Rural area)

Across all focus groups, PNs shared that direct marketing in general practices by ART services encouraging early referrals was a major barrier to more holistic care of infertile people in general practice. The following quotes illustrate this belief among PNs:

“IVF come and do a lunch, and they tell the GPs...what their success rate is...And the GP’s are told: if a couple’s been trying for six months and nothing’s happening, refer them straight away...That’s the standard practice now, and has been for well over 12 months.” (PN, High SES area)

“I’ve noticed...the GP [used to] keep the patient in the clinic and educate them more roundly on lots of things, but now we send them off to specialists.” (PN, Low SES area)

“This kind of educational activity doesn’t fit into a category, for example, chronic disease management, so doctors just send them off to specialists. They do it all the time.” (PN, Low SES area)

The personal nature of the topic was also considered a major barrier to FA education in general practice.

4.4.3.7 The personal ‘nature’ of the topic

Fertility-awareness is highly personal in ‘nature’ and, consequently, this ‘nature’ was considered a major barrier to FA education in general practice. This theme reflects Michie et al.’s (2005) domain of emotion (Domains 10). It centres on participants’ beliefs that some GPs may not feel comfortable raising the topic of FA with their female patients. Whist, conversely, some women may not feel comfortable seeking the information out from their GP. Several female GPs shared that they found it easier to initiate a discussion on FA with female patients they know, than those they don’t know. Similarly, they believed that women who have an established relationship with their GP would find it easier to raise the topic. This belief is encapsulated in the following interview quote:

“I feel that if women have a good relationship with their GP, that this is an issue they can bring up and discuss with their GP. If I don’t know the patient well or if I bring it up and they seem a bit resistant to it then, I suppose this is a barrier.” (Female GP, Low SES area)

Several PNs believed that this particular barrier to FA education in general practice was even greater in the presence of differences between women and their GP; differences included gender, language, culture, and religion, as the following interview quotes encapsulate:

“I know one of the doctors in our practice, he doesn’t feel comfortable doing Pap Smears, so he would possibly feel uncomfortable talking about it [FA].” (PN, High SES area)

“In an Aboriginal community that could be difficult because women might not feel comfortable enough to have that education.”(PN, Rural area)

“A couple of the doctors in our practice have different cultural backgrounds. So I think that is a barrier to them discussing [FA], and also we’ve got certain religions, they’re very strongly religious and I think that can be a barrier when you’re talking about things like fertility and intercourse and that sort of thing.” (PN, Low SES area)

“The fact that nurses are women helps. You know that’s why nurses and female doctors are probably better at this conversation. They don’t even blink about talking about mucus because we’re so used to talking about our periods and menstruating... But I think men really don’t want to go there.” (PN, High SES area)

Further to the personal ‘nature’ of the topic, several female GPs and PNs shared that male GPs especially, may assume that women understand the menstrual cycle and, therefore, consider FA education unnecessary when women report trouble conceiving. The following interview quotes illustrate this belief:

“I just think a lot of doctors assume that they [women] may know, they come in and they say they’re trying for a baby but they may not be asked, do you know your cycle.” (PN, Rural area)

“I think most of the time they [male GPs] assume...that the period cycle will be dealt with by school sex education and parents.”(Female GP, High SES area)

Table 4.21 presents the code category, ranking and frequency of the themes identified in this analysis, highlighting the barriers and enablers, and how best to deliver FA education in general practice, as perceived by GPs and PNs.

Table 4.22 Code category, ranking and frequency of themes of the practitioner interviews

Ranking	Categories	Code Count	Percentage	Theme Group
1	Environmental context and resources	109	24.1	Lack of every day resources
2	Social/professional role and identity	103	22.8	Prevention in health care
3	Knowledge and skills	70	15.5	Not skilled enough
4	Behavioural regulation	70	15.5	Practice options for fertility-awareness education
5	Memory, attention and decision processes	67	14.8	Medical dominance
6	Emotion	32	7.0	The personal 'nature' of the topic

Total sample size, $n = 31$.

4.4.3.1 Overview of Interviews

Using Michie's et al.'s (2004) theoretical behaviour change domains, this qualitative phase with GPs and PNs has helped to conceptualise several important barriers and enablers of FA education in general practice. Whilst unique insights were offered from the different practice perspectives of GPs' and PNs', there was general agreement about the main barriers and enablers of FA education in general practice among these practitioner groups. The main barriers related to a lack of knowledge, skills, time, educational materials, and the personal 'nature of the topic'. The main enablers related to increasing the role of PNs, women's health nurses, and midwives in the delivery of FA education in a collaborative team care arrangement with GPs. These findings will help to facilitate the successful translation of the overall findings of this study into clinical practice.

4.5 Overview of Chapter

This chapter has presented the findings of the different sources of data collection used in this study, which examined FA knowledge, attitudes and practices as modifiable risk factors for infertility from several perspectives within Australia's health system. By drawing on the unique strengths of both

quantitative and qualitative research methods and involving women, PHC practitioners and a review, a comprehensive data set has been created in preparation for analysis in the Discussion Chapter.

In the Discussion Chapter that follows, the findings from the different data sets are examined in the light of the literature review, then compared and contrasted in an analytical process called triangulation (Duffy, 1987; Östlund, Kidd, Wengström, & Rowa-Dewar, 2011; Shih, 1998) to determine the areas of agreement and disagreement concerning FA education in the primary care of people who present in general practice with trouble conceiving. This analysis was undertaken sequentially according to the study design and conducted both within and between Phase 1 and Phase 2 of this study. The resultant conclusions of this analytic process are then synthesised to form the proposed new model of care.

CHAPTER FIVE: DISCUSSION

5.1 Introduction

This study has identified an important gap in the initial assessment and treatment of infertile people in general practice. It found exceptionally low levels of knowledge of FA in Australian women and strongly suggests that this may be contributing cause of infertility. This study also found that this gap in women's knowledge is poorly addressed in general practice. Yet most women, GPs' and PNs' believe that women should receive FA education when first reporting trouble conceiving. These findings strengthen the research evidence that poor FA is a modifiable risk factor for infertility that should be addressed in general practice when women first report trouble conceiving (Blake et al., 1997). Given the Australian Government's emphasis on health promotion and disease prevention through new models of care (Australian Government Department of Health and Ageing, 2010), this study has important implications for GPs and PNs, and suggest that a model of care promoting fertility literacy in infertile women can have consequence for the high cost of ART treatment as well as the increases in risks in morbidity and mortality in mothers and babies associated with ART treatment.

5.2 Women's Health Consumers

Only 2.1 per cent of women attending general practice and 12.7 per cent of women on admission to ART clinics correctly identified the fertile window of the menstrual cycle. With little or no emphasis on FA education in school curricula (Ekelin et al., 2012; Levi et al., 2009) or in Australian mainstream health services (Commonwealth of Australia, 2010), it was not surprising that this study has revealed that most women throughout reproductive life have either no knowledge of FA or poor knowledge of FA. This finding was the same across all targeted SES areas – high, low and rural – in both consumer

surveys of this study, suggesting that it can be generalised to women Australia wide and is concordant with the literature (Hammarberg et al., 2013; Lundsberg et al., 2014; Sievert & Dubois, 2005).

Most women in both consumer groups (those attending general practice and on admission to ART clinics) based what they knew about FA on rhythm – the least accurate FA method (Pallone & Bergus, 2009). This finding suggests that most women fail to appreciate the important limitations of rhythm (Pallone & Bergus, 2009; Stanford et al., 1998; Wilcox et al., 2000), whether they were using rhythm as contraception or actively planning a pregnancy. This is somewhat disconcerting given that rhythm is accurate for less than a third of women who have a regular monthly menstrual cycle (Fehring et al., 2006; Wilcox et al., 2000), and cannot be used by women whose menstrual cycle is irregular (Tilly & Jurow, 2010). As previously noted, in Australia around a third (34.6%) of women who are seeking assisted conception treatment at ART clinics have a female factor fertility problem (Wang et al., 2011) and ovulatory dysfunction is a major contributing cause accounting for 18 to 30 per cent (Chavarro et al., 2007). Why most women choose rhythm over the more accurate temperature and mucus methods is unknown. However, it is plausible that their decision may have been influenced by their knowledge of the fixed 28-day model of the menstrual cycle and a failure to appreciate menstrual cycle variability (Colombo & Masarotto, 2000; Fehring et al., 2006; Wilcox et al., 2000).

5.2.1 Women's Agency to Achieve and Avoid Pregnancy

Although contraception was not the main focus of this study, it was considered important to establish women's understanding of FA in general and in the context of practicing contraception to help determine what they knew about FA before planning a pregnancy.

5.2.1.1 Vulnerability to Unplanned Pregnancy

Of the 56 per cent of women attending general practice who reported using one or more contraceptive methods, 4.3 per cent were relying only on FA or on FA in combination with condoms or

‘withdrawal’. Disconcertingly, these women were not graded as having high FA and had no greater knowledge of FA than women who were using other contraceptives (namely, the oral contraceptive pill and condoms). When poorly understood or applied as contraception, FA methods are associated with high rates of unplanned pregnancy (Trussell, 2004). This would appear to be the first Australian study to measure FA in women who are using FA as contraception, highlighting poor knowledge and, therefore, an avoidable risk factor for unplanned pregnancy in these women (Marie Stopes International, 2008).

Australia has one of the highest rates of unplanned pregnancy of industrialised countries, with an estimated one in two pregnancies being unwanted or mistimed (Read et al., 2009). There is general agreement in the literature that most unplanned pregnancies are potentially avoidable as a result of non-use and inconsistent use of contraception (Loxton & Lucke, 2009; Ong, Temple-Smith, Wong, McNamee, & Fairley, 2012; Read et al., 2009) and misconceptions about the fertile window of the menstrual cycle (Marie Stopes International, 2008; Nettleman, Chung, Brewer, Ayoola, & L. Reed, 2007). Better FA in women practicing contraception holds the potential to reduce these vulnerabilities to unplanned pregnancy. Australia is a multi-cultural society with different family planning needs (Australian Bureau of Statistics, 2008a). This study has revealed that FA education in general practice as contraception is an unmet family planning need among Australian women (Commonwealth of Australia, 2010; The Victorian Ministerial Women's Health Working Party, 1987). Practitioner bias in Australian mainstream health services against women's use of FA for family planning was first raised in the 1980s (The Victorian Ministerial Women's Health Working Party, 1987) and subsequently confirmed more recently in the *2010 National Women's Health Policy* (Commonwealth of Australia, 2010). However, it is believed that offering all women the full range of available contraceptive options at family planning consultations rather than narrowing the range of available choices could lead to more effective contraceptive use among women (Cleland et al., 2006; Marie Stopes International, 2008; The World Health Organization, 2012d). The findings of this study strengthen this argument.

With changing social trends, women in Australia (Australian Bureau of Statistics, 2008a) and other similar countries (National Institute for Health and Clinical Excellence, 2012) are delaying childbearing (Australian Bureau of Statistics, 2008a) when fecundability is naturally reduced (Australian Bureau of Statistics, 2008a; ESHRE Capri Workshop Group, 2005) and with little or no knowledge of the time in the menstrual cycle when they are able to conceive (Blake et al., 1997; Hampton et al., 2012). Better integration of FA knowledge in mainstream culture (Stanford et al., 1998) and better delivery of FA education in mainstream health services (Commonwealth of Australia, 2010) would not only help reduce rates of unplanned pregnancy, but also promote fertility in women who stop contraception and actively plan for pregnancy (Frank-Herrmann et al., 2005).

5.2.1.2 Missed Opportunities for Conceiving

Nearly 10 per cent of the women attending general practice were actively planning a pregnancy, yet only 2.1 per cent correctly identified the fertile window of the menstrual cycle. On admission to ART clinics, typically after failing to conceive for 12 months or more (McLachlan, 2005; Quinn, 2005), most women (87.3%) (Hampton et al., 2012) and (76%) (Blake et al., 1997) still cannot correctly identify this window. This finding reveals that FA as a self-help option to conceiving naturally is poorly addressed in general practice (Blake et al., 1997; Hampton et al., 2012), and suggests that a strong bias exists within this referral system towards specialist care (Kamphuis et al., 2014).

Access to ART treatment in Australia is mediated first by the GP who refers a couple to a specialist (McLachlan, 2005; Quinn, 2005), and second by the specialist who then makes recommendations for a treatment plan (Quinn, 2005). This systematic approach to accessing ART treatment typically takes 12 months or more, and is designed to ensure that the treatment plan is both appropriate and appropriately timed (McLachlan, 2005; Quinn, 2005). Given that most couples who have trouble conceiving are sub-fertile (around 95%), not sterile (Gnoth et al., 2005; Habbema et al., 2004), correctly timed intercourse may help them to conceive (Stanford et al., 2008). Failure to address poorly timed

intercourse for conception in primary care may represent missed opportunities for conceiving naturally while couples wait to be referred on to ART clinics. Analysis of the free-text comments offered by women in the consumer surveys revealed that they believe that FA education should be offered proactively when women first report trouble conceiving, or earlier in certain circumstances when they stop using contraception report they are planning a pregnancy. The importance of proactively addressing modifiable risk factors for infertility in general practice is underscored by the fact that when a couple arrives at an ART clinic they may not want to go back to ‘basics’ and the opportunity of conceiving naturally will have been lost (Eijkemans et al., 2008).

It is deeply concerning that couples are increasingly being referred from general practice to ART clinics (Britt & Miller, 2009) for expensive (Chambers et al., 2006; Sullivan et al., 2008) and highly invasive tertiary level care (Trumble, 2005) when FA, reproductive knowledge fundamental to women’s agency to achieve pregnancy (Frank-Herrmann et al., 2005), is not first being addressed (Blake et al., 1997; Hampton et al., 2012). This is a quality and safety issue in the initial assessment and treatment of infertile people in general practice given the significant increases in morbidity and mortality for both mothers and babies associated with the use of ART treatment (Davies et al., 2012; Osborne et al., 2012; Reddy et al., 2007). It also raises questions about women’s participation in their health care decision-making as is strongly advocated in a number of Australian health care policies (Australian Commission on Safety and Quality in Health Care, 2008; National Health and Medical Research Council, 2004 (revised, 2007)).

5.2.2 Trying to Improve Fertility-Awareness Knowledge

Around a third (37.1%) of the women attending general practice and more than two thirds (86.8%) of the women on admission to ART clinics actively tried to improve their understanding of FA from one or more sources of the information. Of those women who tried to improve their understanding of FA for correct timing of intercourse (Hampton et al., 2012), only a third (30.9%) sought and obtained the

information from their GP. This finding suggests that most GPs tend to underestimate women's interest in this aspect of their reproductive health (Fehring, 2004; Stanford et al., 1999). Why most women looked to other sources of the information, particularly the internet (Fehring, Schneider, & Raviele, 2011) and books is unknown. However, the NICE (2004) guideline advising health practitioners against recommending FA methods for timed intercourse (National Institute for Clinical Excellence, 2004) together with poor knowledge of FA among GPs (Fehring, 2004; Stanford et al., 1999; Stanford et al., 2002; Walsh & Tonti-Filippini, 2000) may, in part, explain this. Analysis of the free-text comments offered by women in the consumer surveys found that women perceive GPs knowledge of FA as being exceptionally poor.

In spite of the apparent efforts of women to improve their understanding of FA, this study shows that a substantial gap exists between what women wanted to know about FA and what they actually know about FA. This finding raises questions not only about the quality and accuracy of the information sources women are currently accessing, but also the fact that the educational needs of women to integrate FA information into knowledge and practice is not being addressed by their primary care practitioners (Hampton et al., 2012; Stanford et al., 1998). By contrast, Blake et al. (1997) found that 80 per cent of women who were experiencing trouble conceiving and who had attended a trained teacher in FA methods correctly identified the fertile window of the menstrual cycle (Blake et al., 1997). Few women in these consumer surveys (only 7.5% of women attending general practice and only 4.9% of infertile women attending ART clinics) sought and obtained FA information from trained teachers in FA methods. Yet, only trained teachers in FA methods are consistently associated with higher levels of the knowledge (Blake et al., 1997; Gibbons et al., 1981; Graham et al., 1983; Hilgers & Stanford, 1998).

Another important finding of the consumer surveys of this study was that when perceived FA was compared with actual FA, most women significantly overestimated the little knowledge that they have. This phenomenon has previously been described in relation to ovulation pain (Sievert & Dubois,

2005), but to my knowledge has not been described in relation to women's use understanding of the fertile period of the menstrual cycle. Women perceiving far greater knowledge of FA than they actually have may be barrier to some women seeking out FA information and also to some GPs to providing FA information.

The consumer surveys of this study highlight some new findings in relation to women's attitudes to FA. Firstly, that around a third (37.1%) of the women attending general practice and more than two thirds (86.8%) of the women attending ART clinics actively tried to improve their understanding of FA. These findings reveal generally positive attitudes to FA in both these consumer groups, and show that interest in FA rises sharply in women who are having trouble conceiving (Lundsberg et al., 2014). This finding suggests that infertile women are aware of their limited fertility knowledge (Dyer et al., 2002) and also of the importance of correctly timed intercourse for natural conception (Blake et al., 1997; Hampton et al., 2012). Secondly, that a high degree of agreement exists between women attending general practice (92.2%) and ART clinics (94.5%) that women should receive FA education when first presenting in general practice with trouble conceiving. These quantitative findings are concordant with the qualitative findings from the analysis of the free-text comments offered by women in the surveys. Together the quantitative and qualitative findings of the surveys clearly show that the great majority of women have generally positive attitudes to FA education in general practice with the hope that it may help some infertile couples to conceive.

5.2.3 The Utility of Home-Use Fertility Tests

The consumer surveys of this study also show that women's use of home-use fertility tests rises sharply when they are having trouble conceiving. Over half (52.0%) of the women attending ART clinics had used ovulation prediction tests, and just under than half (41.3%) had used saliva-based fertility testers. However, of those, only around over half (55.9%) found ovulation prediction tests 'useful' and around a fifth (20.3%) found saliva-based fertility testers 'useful'. Studies have

consistently shown that ovulation prediction tests are far more accurate than saliva-based fertility testers' in helping women to identify the fertile period of the menstrual cycle (Freundl et al., 2003; Maurizio et al., 1999). However, the questions relating to women's use of these fertility tests were not properly conceived as the concept of 'useful' was not rigorously defined, and the resultant data was of limited use as a consequence.

None-the-less, this study has revealed that just over half of women who are having trouble conceiving look to over-the-counter fertility tests to help them identify the fertile period of the menstrual cycle. The large gap found between women's perceived FA and actual FA may have been influenced by their use of over-the-counter fertility tests. However, even if most women did interpret 'useful' as identifying the fertile time of the menstrual, use of these tests would not have closed the gap between perceived FA and actual FA in either consumer group. Correct use and interpretation of home-use fertility tests is heavily reliant on a good understanding of the menstrual cycle (Pray & Pray, 2003; Scolaro et al., 2008). As such, women's overall poor understanding of the menstrual cycle (Blake et al., 1997; Hampton et al., 2012) may have contributed to the poor overall performance and, therefore, usefulness of these tests (Scolaro et al., 2008).

5.2.4 Factors Associated With Higher Levels of Knowledge of Fertility-Awareness

Factors associated with higher levels of knowledge of FA included those women who had accessed a greater a number sources of FA information, books, ovulation prediction tests, and trained teachers in FA methods. Only trained teachers in FA methods are consistently associated with higher levels of knowledge of FA (Blake et al., 1997; Hilgers et al., 1992). No association was found between higher levels of knowledge of FA and the internet – the most frequently accessed source of FA information in both consumer groups of this study – or with SES in either consumer group (Sievert & Dubois, 2005).

5.2.5 Generalisability of the Consumer Findings

Whilst Blake et al. (1997) graded 26 per cent of infertile women as having high FA, far fewer (12.7%) were graded as having high FA in this study. The most likely reason for this observed difference was that a stricter criterion was imposed in this study for attaining a grading of high FA (that is, accurate knowledge of either of the temperature or mucus method combined with documentation of a minimum of 3 menstrual cycles with either method). Two other possible reasons for this observed difference include the fact that Blake et al. (1997) surveyed all infertile women who were attending the New Zealand ART clinic (both first time attendees and repeat attendees), and all in that survey had been trying to conceive for a minimum of two years. In this study, only women on first admission to the ART clinics were surveyed, and most had been trying to conceive for a minimum of just one year.

The socio-demographic characteristics of infertile women who were seeking assisted conception treatment at ART clinics are similar to those reported in other Australian studies in terms of age (Hammarberg & Clark, 2005; Wang et al., 2011), highest level of education attained and years tried to conceive (Hammarberg & Clark, 2005). The percentage diagnosed as having unexplained infertility is similar (23.6% vs 27.6%) to that reported by Wang et al. (2011). However, some differences were noted including higher rates of male factor fertility problems (36.6% vs 20.7%) and female factor fertility problems (53.3% vs 34.67%) when compared with Wang et al.'s (2011) study. These observed differences may be explained by the self-report nature of the data and also the fact that respondents could tick more than one diagnostic category for their infertility. The percentage of women attending general practice who were using FA as contraception is generally concordant with Australian literature (Yusuf & Siedlecky, 2007).

In the next section of the Discussion Chapter, guideline recommendations concerning FA education in the initial assessment and treatment of infertile women are discussed in the light of the consumer findings of this study.

5.3 The Comprehensive Review

The NICE (2004) guideline (National Institute for Clinical Excellence, 2004) was found on three different websites: two national clearing houses or guideline development organisations (the US National Guideline Clearing House and UK National Institute for Health and Clinical Evidence) and one health professional organisation (Royal College of Obstetricians and Gynaecologists (RCOG)), suggesting that it is potentially influential in the initial assessment and treatment of infertile people.

As previously stated in the Results Chapter (see 4.4.1), the NICE (2004) guideline states that: “people who are concerned about their fertility should be informed that sexual intercourse every two to three days optimises the chance of pregnancy. Timing intercourse to coincide with ovulation causes stress and is not recommended” (National Institute for Clinical Excellence, 2004, p. 8). This recommendation is based on Kopitzke et al.’s study (1991) (level 3 evidence) that examined perceived stress levels in women in relation to infertility routines, procedures, medications and events, and is supported by six cohort studies (Bauman, 1981; Corson, 1986; Guermandi et al., 2001; Guida et al., 1999; Martinez et al., 1992; Templeton, 1982); (level 2b evidence) that evaluated the use of the temperature method and urinary luteinising hormone (LH) kits to time intercourse, but found no improvement in the chance of natural conception (National Institute for Clinical Excellence, 2004).

5.3.1 Examination of the Evidence Base

The examination of the evidence base of the NICE (2004) guideline reveals that it is based on poor quality evidence. Kopitzke et al.'s (1991) reports the results of only one study, a mail survey with a sample size of 26 measuring women's perceived stress levels in relation to infertility routines, procedures, medications and events (Kopitzke, Berg, Wilson, & Owens, 1991). In that study, no comparison was made between the perceived stress levels in women who timed intercourse within the fertile window of the menstrual cycle and those continuing intercourse two to three times a week irrespective of the timing of this window (Hampton & Mazza, 2009). It is noteworthy that those women who took their BBT and timed intercourse perceived less stress than those who underwent a number of other fertility-related routines and procedures (Kopitzke et al., 1991).

Furthermore, none of the six supporting cohort studies (Bauman, 1981; Corson, 1986; Guermandi et al., 2001; Guida et al., 1999; Martinez et al., 1992; Templeton, 1982) cited by NICE (2004) (National Institute for Clinical Excellence, 2004) compared conception rates among women who used FA methods for timed intercourse against women who did not use FA methods for timed intercourse. In those studies, only the accuracy of the temperature method and ovulation prediction tests in identifying the time of ovulation in the menstrual cycle were measured (Bauman, 1981; Corson, 1986; Guermandi et al., 2001; Guida et al., 1999; Martinez et al., 1992; Templeton, 1982). It is noteworthy that no study on the mucus method for timed intercourse was included in the NICE (2004) guideline.

5.3.2 Evidence and the Consumer Findings

By contrast to the evidence-base of the NICE (2004) guideline, the consumer findings of this study are based on two different data sets (infertile women on admission to ART clinics and women attending general practice) and much larger sample sizes ($n = 204$ and $n = 328$, respectively), and convergence of the finding that most (94.5% and 92.2%, respectively) believe that women should receive FA education when first reporting trouble conceiving both validates and strengthens it (Cooper et al.,

2010; Duffy, 1987; Medical Research Council, 2008). This finding is concordant with Blake et al.'s (1997) study, which also found that most (83%) women attending an ART clinic wished to learn about FA for timed intercourse (Blake et al., 1997). Adequate sample sizes as determined by sample size calculations, relatively high response rates and use of valid and reliable instruments all add additional strength this finding.

Although research evidence has shown that fecundity rises sharply in the menstrual cycle with both regular intercourse (intercourse 2-3 times a week over the menstrual cycle) (National Institute for Clinical Excellence, 2004) (Dunson et al., 2004) and correctly timed intercourse (Colombo & Masarotto, 2000; Stanford et al., 2002), to my knowledge this is the first study to show women's preferred approach between these two options for optimising the chance of pregnancy. That most women consumers in this study believe that women should receive FA education when first reporting trouble conceiving, suggests that the NICE (2004) guideline recommendation is not in keeping with the beliefs of most contemporary Australian women. Further research is needed to determine the reasons why couples prefer timed intercourse over regular intercourse to optimise the chances of pregnancy.

In addition, there are several other problems with the NICE (2004) guideline recommendation from the perspective of PHC. The first problem is that although regular intercourse (National Institute for Health and Clinical Excellence, 2012) is likely to result in one to two acts of intercourse occurring within the fertile window of the menstrual cycle, this regimen may be difficult for some couples to maintain (Scarpa et al., 2007) and unsatisfactory for others who wish to be certain of timing intercourse correctly (Stanford et al., 2002). Moreover, regular intercourse may not be possible for some couples who are having trouble conceiving. Although this study did not seek to determine the reasons why couples choose correctly timed intercourse over regular intercourse to optimise the chance of pregnancy, a search of the literature offers many plausible reasons. These include the fact that coital frequency can naturally vary substantially between couples (Stanford & Dunson, 2007),

delayed child bearing into the 30s and 40s when frequency of intercourse may be naturally diminished (Colombo & Masarotto, 2000; Colombo et al., 2006; Rosina & Rizzi, 2006; Whitman & Baxley, 2001), health related conditions that reduce libido (Kingsberg, 2009) including the use of prescription medication (Food and Drug Administration (FDA), 2012; Murtagh, 2010), back injury or pain (Berg, Fritzell, & Tropp, 2009), shift work (Nurminen, 1998), work patterns involving long hours of work hours or spending extended periods of time away from home, stress and anxiety (Palacios, Castaño, & Grazziotin, 2009), a history of physical, sexual and emotional abuse (Lutfey, Link, Litman, Rosen, & McKinlay, 2008), and gynaecological conditions (for example, vulvodynia) (Cox & Neville, 2012; Harlow et al., 2014; Thorstensen & Birenbaum, 2012). Plausible reasons why couples might choose timed intercourse over regular intercourse to optimise the chances of pregnancy seem innumerable, highlighting an important limitation of the NICE (2004) guideline recommendation.

The second problem with the NICE (2004) guideline recommendation is that it is contrary to the Australian Government's health system reforms promoting peoples' capacity for self-care through improved health literacy (Australian Government Department of Health and Ageing, 2010). Promoting women's health literacy is considered foundational to advancing their sexual and reproductive health (Australian Women's Health Network, 2012; Commonwealth of Australia, 2010). Primary health care is person-centred care that accounts for the individual circumstances of peoples' lives and actively engages them in their health care planning and decision making (The World Health Organization, 1978, 2008). The Australian Women's Health Network has specifically nominated health literacy in women as one way of reducing infertility through a greater understanding of the underlying causes (Australian Women's Health Network, 2012).

The third problem with the NICE (2004) guideline recommendation is that women have a right to know and understand their fertile body (Hampton & Mazza, 2009). Family planning is considered a health and human right (The World Health Organization, 2012e), and women have a right to information and advice on all methods of family planning and to choose freely the method that best

suits their needs (Cleland et al., 2006; The World Health Organization, 2007). Australian women believe that they should have greater access to education based strategies for family planning in their mainstream health services for reasons relating to reproductive rights, reproductive choice, and greater reproductive autonomy (Commonwealth of Australia, 2010).

This evaluation suggests that the NICE (2004) guideline recommendation should not be uncritically adopted in the initial assessment and treatment of infertile people, and that high quality evidence-based guidelines concerning FA education in the primary care of infertile people are needed. Such guidelines are needed to help close the gap between current clinical practice and the best available evidence.

5.3.3 Limitations of the Review

The comprehensive review was conducted in 2011. The NICE (2004) guideline was for updating in October 2012 but this was delayed (National Institute for Health and Clinical Excellence, 2013). The draft, *Fertility: assessment and treatment for people with fertility problems (update): Draft for stakeholder consultation – May 2012*, reiterates that timed intercourse can be an emotionally stressful intervention in the initial assessment and treatment of infertile people but stops short of actively dissuading practitioners against recommending this approach to optimise the chances of natural conception (National Institute for Health and Clinical Excellence, 2012). At the time of writing up this review, the draft document was still awaiting ratification (National Institute for Health and Clinical Excellence, 2012). It is anticipated that the findings of this review will be submitted for consideration when *Fertility: assessment and treatment for people with fertility problem*. NICE (2012) is review in 2015 (personal communication, Helen Crosbie, Communications Executive, The National Institute of Clinical Evidence, November 29, 2013).

The comprehensive review of this study has revealed that the NICE (2004) guideline recommendation is contrary to the views of most women attending general practice and ART clinics, and also to the aims of person-centred care and PHC. In the next section of the Discussion Chapter the findings of the practitioner survey are compared and contrasted with findings of all previous investigations of the study.

5.4 Practitioner Survey

The practitioner survey revealed that most GPs' and PNs' (91.8%) are aware of women's overall low level of knowledge of FA (Blake et al., 1997; Hampton et al., 2012). Only 8.2 per cent of these practitioners believed that women's knowledge of FA is either high or very high. Consequently, like most women in the consumer surveys, the majority (89.2%) of GPs' and PNs' also believed that women should receive FA education when first reporting trouble conceiving. The finding that on the whole most (82.8%) GPs' and PNs' do not immediately refer infertile women on to ART clinics, suggests that time is theoretically available for FA education in the initial assessment and treatment of infertile people in general practice.

5.4.1 Misconceptions in Fertility-Awareness Knowledge and Practices

As GPs in Australia are typically the first point of medical contact when people first become concerned about not conceiving (McLachlan, 2005; Quinn, 2005), it was unsurprising to find that most clinical services in general practice for infertile people – including FA education – are currently provided by GPs, not PNs, with a *p*-value of <0.001 for each clinical service surveyed in this study. Of the practitioners who provided FA education, ordered logistic regression analysis revealed they were more likely to be female and have some training in FA methods, with a *p*-value of <0.001 for each of these attributes.

Overall, just over half (55.5%) of the practitioners in this survey provided FA education for women who reported trouble conceiving. Disappointingly, most was based on rhythm (56.6%) (Fehring, 2004; Stanford et al., 2002). This finding closely mirrors that of the consumer surveys of this study, highlighting that most women and their PHC practitioners alike fail to appreciate the important limitations of rhythm for optimising natural conception (Fehring et al., 2006; Pallone & Bergus, 2009; Wilcox et al., 2000). This is despite the fact that rhythm has been outdated for several decades (Pallone & Bergus, 2009) and the limitations have been extensively documented (Fehring et al., 2006; Pallone & Bergus, 2009; Wilcox et al., 2000). As previously noted, rhythm can only estimate the timing of fertile window of the menstrual cycle (Stanford et al., 2002). Rhythm, therefore, necessitates intercourse to occur daily or second daily over many more days than pregnancy is a possibility (Pallone & Bergus, 2009). This regimen may be difficult for some couples to maintain (Scarpa et al., 2007), and inadequate for others who wish to understand their fertile body (Hampton & Mazza, 2009) and be certain that intercourse was correctly timed (Stanford et al., 2002).

After rhythm, mucus was the next most frequently taught method of FA in general practice. Despite the fact that most GPs and PNs (81.3%) correctly identified fertile-type mucus from the available survey options, less than half (47.1%) provided instructions for its use. Poor overall knowledge of the mucus method among GPs (Fehring, 2004; Stanford et al., 1999; Walsh & Tonti-Filippini, 2000), nurses and midwives (Fehring, 2004), together with a lack of detailed knowledge about the relationship between cervical mucus and the chances of conceiving in the menstrual cycle are the most likely reasons for this (Fehring, 2004; Stanford et al., 1999). Whilst this finding was somewhat expected, it is none-the-less disappointing given the important advantages of mucus over rhythm in helping couples to conceive. The main advantages being that it prospectively and accurately identifies the fertile window of the menstrual cycle, whether the menstrual cycle is monthly and regular or irregular (Billings & Westmore, 1980; Odeblad, 1994; Pallone & Bergus, 2009) and enables women to know for certain that intercourse was optimally timed for conception (Stanford et al., 2002).

The temperature method was the least taught FA method in general practice (36.0%). Of those practitioners who provided instructions for its use, less than a third (33.4%) understood the BBT change that indicates the timing of ovulation in the menstrual cycle, and around half (47.3%) believed that a woman's peak fertile time in the menstrual cycle occurs after the BBT rise, rather than just before the BBT rise. These findings reveal that nearly half of all PHC practitioners providing instructions for use of the temperature method fail to understand the retrospective nature of this method in identifying the fertile time of the menstrual cycle (Pallone & Bergus, 2009; Tham et al., 2012). These misconceptions were similarly observed in the consumer surveys of this study. Likewise, only 10 per cent of women in a large study in the United States were aware that intercourse needs to occur before ovulation for a chance of pregnancy (Lundsberg et al., 2014).

The practitioner survey of this study shows that most FA education in general practice is provided by GPs but is not based on the best available evidence (Pallone & Bergus, 2009; Stanford et al., 2002). Determining the reasons for this was beyond the scope of this study. However, clinical practice time constraints faced by most GPs combined with inadequate education and training in FA methods (Fehring, 2004; Walsh & Tonti-Filippini, 2000) are the most likely reasons that practitioners recommend rhythm over the more accurate temperature and mucus methods (Stanford et al., 1999). Instructions for rhythm are typically less time consuming than are instructions for the temperature and mucus methods. Another possible reason that GPs, especially male GPs, recommend rhythm is that they may find it less embarrassing as rhythm does not require an in-depth discussion about the menstrual cycle.

Correctly timed intercourse over a minimum of six menstrual cycles is necessary to optimise the chances of pregnancy (Colombo & Masarotto, 2000; Stanford et al., 2002; Wilcox et al., 1995). As such, it is crucial that FA education be initiated promptly when women first report trouble conceiving (Hampton et al., 2012), is accurate, and based on the best available evidence (Pallone & Bergus,

2009). In Australia, the usual waiting time to accessing ART treatment is around 12 months of infertility (McLachlan, 2005; Quinn, 2005). This relatively short waiting period may be even shorter (around 6 months) in certain circumstances, such as when women are aged 35 years or older (McLachlan, 2005), highlighting the importance of initiating this intervention promptly.

5.4.2 Attitudes to Fertility-Awareness Education

Ordered logistic regression analysis revealed that PNs were less likely than GPs to provide FA education, but were more likely than GPs to recommend GPs or nurses with a special interest in FA education, trained teachers in FA methods and books and pamphlets, with a *p*-value of <0.001 for each of these recommendations. Practice nurses were less likely than GPs to refer patients to IVF clinics for FA information with a *p*-value of <0.001 for this recommendation.

Whilst there was no significant difference between GPs' and PNs' ratings of women's overall knowledge of FA, significant differences were noted when their ratings of their own overall knowledge of FA were compared. Ordered logistic regression analysis revealed that PNs' rated their own overall knowledge of FA significantly below that which GPs rated theirs, with a *p*-value of <0.001. This was anticipated given that few PNs currently provide family planning services in general practice (Watts et al., 2004) and were less likely than GPs to have had some education and training in FA methods, as identified in Table 18 (see 4.4.2.1, Chapter Four). However, surprisingly, PNs' were significantly more likely than GPs to understand that the temperature and mucus methods are far more helpful than rhythm for women who are having trouble conceiving, with a *p*-value of <0.001 for each of these methods. This may suggest that PNs have a better grasp of FA methods than GPs do, even though it falls outside their current scope of practice (Watts et al., 2004).

Interest in professional development in FA methods was generally very positive among both GPs and PN's alike. Although, around a half (51.2%) of the practitioner respondents stated that they had

received some education and training in FA methods, less than a third (30.1%) rated their own overall knowledge of FA as either high or very high and most (72.4%) wished to undertake professional development in this field of clinical practice. These findings reveal that most practitioners, whether or not they have undergone any previous training in FA methods, believe they are inadequately prepared to instruct women in the use of FA methods (Fehring, 2004). Even GPs, and specifically female GPs, who currently provide FA education, expressed interest in undertaking professional development in FA methods.

Ordered logistic regression analysis revealed that being a PN was associated with a higher level of interest in professional development in FA methods compared with GPs, but this factor was not statistically significant, with a *p*-value of > 0.05 ($P = .403$). However, the free-text comments offered by the PNs' provided insight for the first time in this study interest among PNs in taking up a role in FA education. The most frequently cited reasons for their interest were the importance of the knowledge to prevention in the health care infertile women (Gnoth et al., 2003; Gnoth et al., 2005), and that FA education was particularly suited to nursing practice (Fehring, 2004).

General practitioners and PNs were asked to nominate their most preferred practitioner group – either from within or outside the general practice setting – to provide FA education for women who report trouble conceiving. As identified in 4.4.2.4, Chapter Four, the preferred order of the nominated groups clearly show that nurses, whether they are women's health nurses, midwives or PNs, are the most preferred practitioner group to provide FA education. Around 26 per cent of PNs in Australia are Registered Midwives or hold qualifications in women's health (Australian Medicare Local Alliance, 2012). It was interesting to note that even though midwifery is a woman-centred practice (Australian Nursing and Midwifery Council, 2009), no midwife in the practitioner survey or in the focus groups indicated that they had sufficient knowledge or skill to be able to teach women about FA.

The preference for nurses and midwives to provide FA education in general practice for women who report trouble conceiving contrasts sharply with current practice, as identified in 4.4.2.2, Chapter Four. However, two themes dominated the free-text comments in relation to this particular question. These were that: (1) FA knowledge is specialist knowledge which should be provided by specially trained practitioners and, (2) it does not matter which practitioner group provides FA education as long as they are appropriately trained and have the necessary time. These caveats suggest a shared interest in this field of clinical practice among GPs and PNs.

5.4.3 Generalisability of Survey Findings

When the socio-demographic characteristics of the GP respondents were compared with national health workforce data (Britt et al., 2010), they were slightly older (28.8% vs 30.0% were 45 years or younger) and significantly more likely to be female (55.4% vs 37.1%). These differences may have introduced bias into the findings. For example, the high proportion of female GP respondents may suggest a greater knowledge of and interest in FA methods among GPs than there actually is; thus, limiting the generalisability of the survey findings to GPs in general. When the socio-demographic characteristics of the PN respondents were compared with general practice nurse workforce data (Australian Medicare Local Alliance, 2012), they were similar in terms of gender, with most being female (97.4% vs 98.0%). The age groups of the PN respondents were not directly comparable with general practice nurse workforce data (Australian Medicare Local Alliance, 2012); however, they were similar with 88.4 per cent being aged 35 years or older compared with 81.3% being 40 years or older (Australian Medicare Local Alliance, 2012).

The findings of the practitioner survey have shown generally positive attitudes to FA education in general practice for women who present with trouble conceiving. In the next section of the Discussion Chapter, the barriers and enablers, and how best to provide FA education in general practice are discussed in the light of the findings of all previous investigations of this study. The main findings of the previous investigations helped to inform the question schedule used in the interviews with GPs and focus groups with PNs.

5.5 Practitioner Interviews and Focus Groups

In keeping with the Australian Government's health system reforms (Australian Government Department of Health and Ageing, 2010) and peak medical (The Royal Australian College of General Practitioners, 2011) and nursing organisations (Australian Practice Nurses Association, 2011; Royal College of Nursing Australia, 1999), the GP and PN participants in the interviews believed that prevention in health care is core work in general practice (Royal Australian College of General Practitioners, 2012). They acknowledged that most preventive activities in general practice are currently focused on older populations (Britt et al., 2011), and that GPs and PNs could play a greater role in prevention in younger cohorts, including for women who present with trouble conceiving.

5.5.1 Perceived Benefits of Fertility-Awareness Education

Most GPs and PNs did not initially understand the term 'fertility-awareness'. However, once explained, the benefits for women who are having trouble conceiving were generally appreciated. They believed that the knowledge is essential for women to know how to self-manage their fertility (Frank-Herrmann et al., 2005), it may help some infertile couples to avoid the stress and expense of unnecessary ART treatment (Frank-Herrmann et al., 2005; Gnoth et al., 2005; Stanford et al., 2002), it provides an alternative for those who cannot to use ART treatment or choose not to use ART treatment (ESHRE Capri Workshop Group, 2004; Herbert, Lucke, & Dobson, 2009b), and would improve the health care of infertile people who live outside major Australian cities (Australian Women's Health Network, 2012). The potential benefits of FA education were especially recognised in relation to the stressful nature of ART treatment (ESHRE Capri Workshop Group, 2004), the high cost of ART treatment (Chambers et al., 2006; Sullivan et al., 2008), and the difficulties women face outside major cities in accessing ART treatment (Australian Women's Health Network, 2012).

Ideally, GPs, especially female GPs', and PNs' believed that FA education would be proactively offered during the preconception health check. Women of advanced maternal age (McLachlan, 2005;

Royal Australian College of General Practitioners, 2012) or with a lifestyle risk factor known to affect fertility (Haywood, 2009) were considered especially suitable for such an intervention during the preconception health check. However, while this health check offers an important window of opportunity for initiating health promoting interventions (Keirse, 2009; Royal Australian College of General Practitioners, 2012), there was agreement among GPs and PNs that it is significantly underutilised by women planning a pregnancy greatly limiting this opportunity (Callaway, O’Callaghan, & McIntyre, 2009). Only 53 per cent of expectant mothers in Australia have attended the preconception health check (Callaway et al., 2009), highlighting the importance of offering FA education opportunistically in primary care (Barron, 2013).

5.5.2 The Practice Gap in Fertility-Awareness Education

Despite the perceived benefits of FA education, this qualitative phase of the study shows that most GPs and PNs neither routinely nor opportunistically provide FA education for women who present with trouble conceiving. This was summarized in the words of one PN who stated that FA education tends to “slip under the radar” in general practice for a whole range of reasons. This was in spite of the fact that most GPs and PNs were aware of women’s overall poor understanding of FA as well as their high level of interest in their reproductive health when they are having trouble conceiving (Blake et al., 1997; Hampton et al., 2012).

This qualitative phase shows that most FA education in general practice is provided only when specifically requested and when time permits primarily by female GPs. This approach to FA education in general practice limits couples’ access to this self-care intervention, which may help them to conceive. This qualitative finding does not entirely accord with findings of the practitioner survey, which found that more than half (55.5%) of PHC practitioners usually provide FA education when women report trouble conceiving. However, as previously stated, this may be explained by the high

female GP response rate in the practitioner survey. In Australia, most sexual and reproductive health care for women in general practice is provided by female GPs (Mills et al., 2012).

5.5.3 The Main Barriers: Time, Knowledge, Resources and Gender

Consistent with the free-text comments offered in the practitioner survey, the main barriers to FA education in general practice, as perceived by GPs' and PNs' in the interviews were a lack of time, training (Fehring, 2004; Kelly et al., 2012), and educational materials (Kelly et al., 2012). These barriers to preventive health care in general practice are recognised in other health contexts (Mitchell et al., 2011).

General practitioners frequently cited these barriers as reasons for referring infertile women from general practice on to specialists. There was a shared belief among GPs' (especially male GPs') that the management of infertility was complex and beyond their skill level. As a consequence, most GPs believed that infertile women are better cared for by specialists, and that specialists would provide FA education if they deemed it appropriate. The finding of this study that few infertile women attending ART clinics understand the fertile window of the menstrual cycle counters this belief (Hampton et al., 2012).

Practice nurses expressed concern that the main barriers to FA education in general practice were contributing to the rising referral rates to specialists (Britt & Miller, 2009), and that infertile women were being referred on to specialists prematurely (Eijkemans et al., 2008; Kamphuis et al., 2014) and often without demonstrating an actual need to see a specialist. They also believed that these barriers in tandem with regular advertising in general practice by ART services encouraging early referrals to specialists were contributing to an overall decline in the holistic care of infertile people in general practice. These observations among PNs are concordant with Australian general practice activity data, which have shown rising referral rates to specialists over the past few decades (Britt & Miller, 2009)

coinciding with the declining care of infertile people in general practice (Britt & Miller, 2009; Britt et al., 2011). Practice nurses also believe that short GP consultations made it difficult for women to raise the topic of FA with their GP and, in the absence of having such a conversation, women may not realise how limited their knowledge of FA actually is. This perception among PNs in the interviews reflect important findings of the consumer surveys of this study, which showed that most women greatly overestimated their limited knowledge of FA and at the same time expressed difficulty in discussing FA with others, including with their GP. Uncertainty and embarrassment were the main reasons women cited for their reluctance to discuss this sexual health issue with their GP (Hampton et al., 2012).

For fear of embarrassment, many patients do not raise their concerns about health sexual issues with their health practitioner (Dahir, 2011; Kingsberg, 2009; Mercer et al., 2003) and, conversely, for the same reasons many health practitioners do not ask their patients about this aspect of their health (Hinchliff et al., 2004; Kingsberg, 2009). Although the contribution of sexual functioning to a diagnosis of infertility is largely unknown (Habbema et al., 2004; Tingen et al., 2004), proponents of FA education believe that it is sizeable (Stanford & Dunson, 2007). Despite barriers to such discussions, most women believe that their health practitioner is the preferred source of information concerning knowledge of fertility, conception and related issues (Lundsberg et al., 2014).

Given the discrete nature of the fertile window of the menstrual cycle and the fact that no pregnancy has ever been recorded with intercourse outside this window (Wilcox et al., 1995), proponents of FA have long argued that both infrequent and mistimed intercourse should be considered possible contributing causes of infertility (McCusker, 1982; Stanford & Dunson, 2007). A lack of information about the timing of intercourse in relation to ovulation has been described as missing information in the diagnosis and management of infertility (Dunson et al., 2002; ESHRE Capri Workshop Group, 2004; Stanford et al., 2010). Left unaddressed in the initial assessment and treatment of infertile people, both infrequent and mistimed intercourse can lead to unnecessary ART treatment (Stanford &

Dunson, 2007). That few women (12.7%) in this study who were seeking fertility assistance at ART clinics correctly identified the fertile window of the menstrual cycle (Hampton et al., 2012) lends strength to this argument.

Numerous studies have shown that a lack of time, practitioner's gender and embarrassment are major barriers to addressing sexual and reproductive health matters in general practice (Gott, Galena, Hinchliff, & Elford, 2004; Hinchliff, Gott, & Galena, 2004; Kingsberg, 2009; Mazza, Chapman, & Michie, 2013; Mercer et al., 2003; Murtagh, 2010). Failure to appropriately address sexual and reproductive health issues in general practice can negatively impact the health of people (Australian Women's Health Network, 2012; Hinchliff et al., 2004) and also the overall health system (Australian Women's Health Network, 2012).

5.5.4 Targeting the Barriers to Improve the Delivery of Fertility-Awareness Education

Factors believed to improve the delivery of FA education in general practice included increasing the use of nurses and midwives in the delivery of FA education, professional development in FA methods, patient educational materials to guide the delivery of FA education, and a collaborative model of care. Each of these enablers to FA education in general practice is presented below.

5.5.4.1 Increasing the use of Nurses and Midwives

There was general agreement among GPs and PNs both in the practitioner survey and in the interviews that nurses and midwives are the most preferred practitioner groups to provide FA education. Both GPs and PNs believed that specially trained nurses and midwives in the delivery of FA education would improve both the quality and accessibility of FA education in general practice for three main reasons: these being that nurses have a greater capacity to allocate the necessary time, nurses and midwives are a highly feminised health care workforce, and the distribution and employment of nurses across Australia.

Nurses and midwives have a greater capacity to allocate the necessary time

Nurses and midwives were believed to have a greater capacity to allocate time for FA education in general practice. This was considered important because GPs are generally time poor (Australian Government Department of Health and Ageing, 2009) and FA education is considered time consuming (Kelly et al., 2012). Adequate consultation time is crucial to establishing patient-centred care for effective interventions (Ehrlich et al., 2013; National Ageing Research Institute, 2006). Nearly 90 per cent (89.1%) of general practices Australia wide have registered to participate in the PNIP (Australian Medicare Local Alliance, 2012), theoretically providing funding for nurses and midwives to allocate time for FA education. However, disappointingly, few GPs and PNs indicated awareness of the PNIP with most still believing that a Medicare item number was necessary for remuneration of care services provided by nurses. This may be explained, in-part, by the fact that the PNIP was launched only months prior to the interviews of this study being conducted, and suggests that further education of GPs and PNs is needed for this new funding arrangement to be fully realised.

Nurses and midwives are a highly feminised health workforce

As a highly feminised health care workforce (Australian Medicare Local Alliance, 2012) there was general agreement among GPs and PNs that greater use of PNs (nurses and midwives) in the provision of FA education would make it easier for women to discuss FA with a practitioner and also for practitioners to provide FA instructions (Bekaert, 2003; Hinchliff et al., 2004). Nearly 98 per cent (97.4%) of PNs are female (Australian Medicare Local Alliance, 2012) compared with just a third (37.1%) of GPs (Britt et al., 2010). Women's preference for seeing female health practitioners over male health practitioners for sexual and reproductive health care is widely accepted (Britt & Miller, 2009; Commonwealth of Australia, 2010; Mills et al., 2012), and also known to increase time pressures on female GPs (Mills et al., 2012). Greater use of PNs in the delivery of sexual health services would, therefore, not only improve accessibility of these services in general practice but also reduce practice time pressures on female GPs (Mills et al., 2012). Being a large and mostly female

profession from diverse backgrounds, PNs' also believed that they could help to bridge a number of other differences that are barriers to FA education in general practice – these being language, culture, and religion.

Distribution of practice nurses employed across Australia

Greater use of PNs in the delivery of FA education has the potential to increase the accessibility of FA education in general practice Australia wide, and especially in rural and remote regions of Australia. Practice nursing is the fastest growing health care workforce in Australia (Australian Practice Nurses Association, 2008). Two thirds (63.3%) of all general practices nationwide and most (86.6%) outside major cities currently employ at least one PN (Australian Medicare Local Alliance, 2012). A greater proportion of nurses and midwives than doctors are employed in outer regional, remote and very remote areas (Health Workforce Australia, 2012a). The high number of PNs employed in general practice outside major cities is especially important as access to female GPs is low in these areas (Commonwealth of Australia, 2010). In rural and remote areas of Australia the PN may be the only consistent health care provider, as GPs often stay for only short contract periods in these areas (Mills et al., 2012). Having an established patient/practitioner relationship improves women's confidence in being able to raise sexual and reproductive health issues in consultations (Murtagh, 2010) and is crucial for patient-centred care (Commonwealth of Australia, 2009, 2010; McCormack et al., 2008).

5.5.4.2 A Professional Development

As Australia's health system shifts away from specialist care to community-based care (Australian Government Department of Health and Ageing, 2010), education of nurses in general practice is needed to meet new and emerging health care demands in their community (Keleher, Parker, & Francis, 2010; Parker et al., 2011; Parker et al., 2010). Practice nurses have previously indicated interest in professional development in family planning and sexual health services (Keleher & Parker, 2013; Watts et al., 2004), with many stating both in the practitioner survey and in the interviews that

they could provide FA education with appropriate education and training, and resources (Fehring, 2004; Kelly et al., 2012). However, before they could take up a new role in this field of clinical practice, PNs also believed that they would need the support of practice management (Ehrlich et al., 2013).

Both GPs and PNs believe that FA education fits particularly well with nursing practice (Fehring, 2004), as nursing interventions typically have an emphasis on health literacy and life-management skills (Britt & Miller, 2009). Practice nurses believe they are effective in promoting health literacy and self-management skills in primary care (Harris et al., 2009), and that patients' trust them and find them approachable (Bekaert, 2003; Mitchell et al., 2011). However, there was a shared belief among GPs and PNs that before nurses and midwives can take up a role in FA education they first need to undergo a program of professional development, as quality assurance in the delivery of FA education is necessary to optimise patient health outcomes (Fehring, 2004; Kelly et al., 2012) and for effective and trusting team care arrangements.

It was suggested that professional development in FA methods should be to the minimum level of a certificate course and that updates occur at regular intervals to keep them current. Online education was the preferred mode of professional development for reasons relating to cost, time, convenience and geographic location (Parker et al., 2011). Online education increases accessibility of educational opportunities regardless of geographic location (Halcomb, Meadley, & Streeter, 2009) and this was considered especially important for PNs and GPs who live in locations outside major Australian cities.

5.5.4.3 Quality Patient Educational Materials

To help guide the delivery of FA education in general practice, both GPs and PNs believed that patient educational materials are needed that are evidence-informed, concise and readily available (Kelly et al., 2012) (for example, downloadable from their computer). These materials were considered

especially important for practitioners who provided FA education only occasionally and also for women to take away with them for ongoing reference. It was believed that these materials should be in different languages, culturally appropriate and targeted to women's level of health literacy (Kelly et al., 2012). Embedding new models of care in general practice and making them sustainable is highly dependent on quality guidance that is clear, relevant and pragmatic (Ehrlich et al., 2013).

5.5.4.4 A Collaborative Model of Care

Both GPs and PNs believed that a collaborative team care arrangement was the most suitable model of practice for the delivery of FA education in general practice. Across a range of health care areas, collaborative team care arrangements have consistently demonstrated better health outcomes for patients compared with non-team-based care (Kesson, Allardice, George, Burns, & Morrison, 2012). Multidisciplinary care is comprehensive, patient-centred, reduces fragmentation, duplication and wastage, and includes public health and prevention programs (Australian Government Department of Health and Ageing, 2010). Diabetes education (Australian Diabetes Education Association) and chronic disease management (Keleher et al., 2007) were offered as examples of successful collaborative team care arrangements currently operating in general practice upon which FA education could be based. In practices where demand for FA education is low, alternative arrangements were suggested, including a visiting fertility nurse specialist or establishing referral pathways with the nearest family planning or well women's health service that provide FA education (Kelly et al., 2012). Understanding the clinical practice context and building local referral pathways for coordination of care is considered a key element of high quality care (Ehrlich et al., 2013). In addition to these practice options, PNs suggested that they could expand FA education into group education and public health campaigns, and play a role in promoting FA education in school sex education curricula. Making FA knowledge more accessible to women from the beginning of reproductive life through sex education in schools was also suggested by women in the consumer surveys of this study. Both

women and PNs believed that better knowledge of FA from the beginning of reproductive life would help women to achieve and avoid pregnancy throughout reproductive life.

These practice options to improve the delivery of FA education in primary care are in alignment with a number of national (Australian Women's Health Network, 2012; Commonwealth of Australia, 2010) and international (The World Health Organization, 2012c) policies and reports that aim to advance women's sexual and reproductive health through task shifting or sharing of specific family planning services among doctors and nurses. This shared approach to family planning practice optimises the health care workforce for more effective family planning services by expanding access, promoting health equity and increasing prevention in health care, especially among rural people and other disadvantaged groups (Fathalla et al., 2006; The World Health Organization, 2012c).

These practice options also suggest a pragmatism among GPs and PNs cognisant of the increasing workload of GPs nationwide and the increasing and changing roles of PNs in care service provision (Australian Government Department of Health and Ageing, 2009). The willingness among GPs to relinquish or share certain health care roles with PNs in collaborative team care arrangements is considered a key enabler of expanded practice roles for PNs (Mills et al., 2012).

However, implementation of a collaborative model of care to improve the delivery of FA education in general practice will require a major cultural shift in current practice among GPs. Only eight per cent of preventive health care activities in general practice involve a nurse (Britt et al., 2011), and only 10 per cent of GPs currently refer to other health care practitioners for interventions (Mazza & Harris, 2010). In addition, a number of other impediments will need to be removed before the full potential of nurses in expanded roles in general practice can be realised, including poor remuneration and lack of professional recognition (Australian Medicare Local Alliance, 2012; Halcomb et al., 2008; Joyce & Piterman, 2009; Parker et al., 2010; Phillips et al., 2008), and lack of career pathway that may encourage PNs to invest in education (Parker et al., 2011).

5.5.5 Closing the Gap in Women's Knowledge of Fertility-Awareness

The high prevalence of poor reproductive knowledge in women in Australia (Clark & Mackenzie, 2007; Hammarberg et al., 2013; Hampton et al., 2012) highlights the potential role health practitioners, especially PHC practitioners, could play in ameliorating this discrepancy to assist women to achieve their reproductive life plan (Blake et al., 1997; Hampton et al., 2012). As general practice is typically the first point of medical contact when people first become concerned about not conceiving (McLachlan, 2005; Quinn, 2005), mainstreaming FA education in general practice (Commonwealth of Australia, 2010; Hampton et al., 2012) by specially trained nurses and midwives in FA methods would optimally support infertile women to attain this important reproductive knowledge (Hampton et al., 2012). Crucially, it has been noted that GPs who are aware of trained teachers' in FA methods in their area are significantly more likely to refer to these teachers and also to recommend use of the most accurate FA method – mucus – for correct timing of intercourse (Stanford et al., 1999).

5.5.6 Expanding the Roles of Nurses and Midwives in Fertility-Awareness Education

With professional development in FA methods, expanded scopes of practice and use of the new PNIP funding arrangement (Department of Health and Ageing, 2012; Parker et al., 2011), nurses and midwives in general practice have the potential to make a substantial contribution to the primary care of infertile people (Hampton et al., 2012). There is general agreement among GPs' and PNs' that FA education fits well with nursing practice, sufficient time should be allocated in general practice for FA education, and that FA education can improve patient outcomes. These beliefs fulfil several preconditions necessary for successfully embedding a nurse model of care in general practice (Ehrlich et al., 2013). Furthermore, that the great majority of women and their PHC practitioners believe that women should receive FA education when first reporting trouble conceiving, suggests that a new model of care promoting FA in general practice would be accepted by both women and their PHC practitioners alike.

Whilst, ideally FA education would be offered in structured consultations, PN's believed that it could also be offered opportunistically in the context of other health care services that they provide (Barron, 2013), including for example women's health checks and Pap tests.

To encourage women's uptake of FA education in general practice, GPs and PNs believe that patients will need educating to raise their awareness of the availability of this new service. Advertisements in clinic posters, pamphlets, handouts and newsletters were suggested as ways of achieving this (Bekaert, 2003; Department of Health and Ageing, 2012; Halcomb et al., 2005).

5.5.7 Contributing to Innovation in Health Care Delivery

A new model of care promoting FA in general practice would address an identified gap in the primary care of infertile people and would contribute to innovation in health care delivery in Australia. Innovation in health care delivery through new models of care promoting health literacy is seen as the best way of containing rising health care costs while improving quality, safety and satisfaction in health care for patients (Australian Government Department of Health and Ageing, 2010; Australian Women's Health Network, 2012; Erickson, Ditomassi, & Adams, 2012). Growing the roles of nurses in general practice in health promotion and disease prevention is crucial for the full vision of PHC to be realised in Australia (Australian Government Department of Health and Ageing, 2010). Developing new models of care and broader scopes of practice for nurses is seen as the best way to attract and retain nurses in Australia's health care workforce (Health Workforce Australia, 2012b), and has the greatest impact on reducing the gap between health care workforce demand and supply for the overall sustainability of Australia's health system into the future (Health Workforce Australia, 2012a).

In the final section of the Discussion Chapter, the findings of all investigations of this study are synthesised to inform the proposed new model of care to improve the delivery of FA in general practice for women who present with trouble conceiving.

5.6 A New Model of Care

Using a well planned systematic approach, this study has identified several key elements of a new model of care to improve the delivery of FA in general practice. The key elements are underpinned by Orem's nursing theory of self-care (Denyes et al., 2001) and by the principles of PHC (The World Health Organization, 1978, 2008). The key elements form the essential components of a pragmatic model of care. These being, a self-care theory and consumer participation in identification of needs, evidence-based practice, quality improvement and collaborative methodology, change management theory, and disease management (Davidson et al., 2006).

The key elements of the proposed new model of care are organised under the following three health contexts:

1. Person-centred care: The intervention would be person-centred promoting women's understanding of FA and of the lifestyles that influence their ability to conceive. The intervention would promote self-care and care of others before conception for health promotion and disease prevention in children and their parents. Person-centred care promotes the empowerment of health consumers. This is achieved through respectful relationships between health consumers and their health care providers and by information sharing and partaking in decision making. Person-centred care would promote equity in health care in the initial assessment and care of infertile people regardless of geographic location, income, cultural or religious beliefs..

2. A supportive practice environment: The intervention would be delivered within a collaborative team care arrangement by GPs and PNs (nurses and midwives), and would be supported by the practice environment through the allocation of time, funding, and evidence-informed patient education materials. The intervention would be both holistic and comprehensive addressing all known modifiable risk factors for infertility (including cigarette smoking, being overweight or obese and alcohol consumption), embedded within women's mainstream health services, and integrated on the continuum of care for infertile people.
3. Skilled health practitioners: The intervention would be informed by the best available evidence in the field of FA education and would be delivered by specially trained health practitioners in FA education. The intervention would be flexible allowing for it to be delivered by both GPs and PNs (nurses and midwives). These health practitioners would have a critical awareness of fertility issues, clarity of related values and beliefs, highly developed interpersonal skills, and be committed to the aims and philosophy of PHC. The intervention would be supported and promoted through group education, secondary school curricula development, and public health campaigns. The key elements of the proposed new model of care are presented in Figure 5.1.

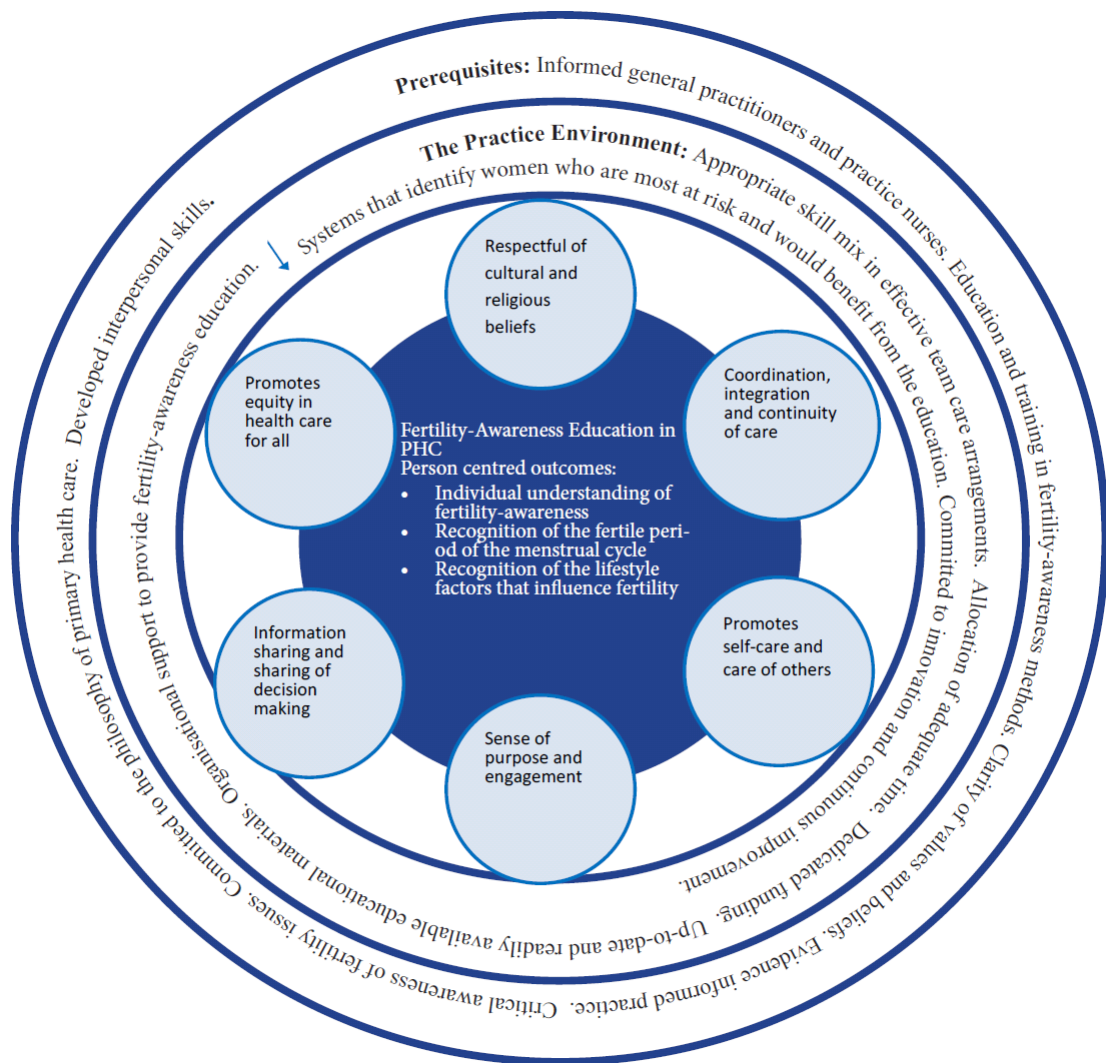


Figure 5.1 Person-Centred Model of Care to Improve the Delivery of Fertility-Awareness Education in General Practice. Adapted from the Person-Centred Care Framework (McCormack et al., 2008)

5.7 What This Study Adds

This study provides new and important insights into FA knowledge, attitudes and practices of women and their PHC practitioners, and on how best to improve the delivery of FA education in general practices for women who present with trouble conceiving. These insights are that:

Most women who are having trouble conceiving actively try to improve their understanding of FA for correct timing of intercourse to optimise their chances of conceiving, but fail to attain this important

knowledge from the sources of the information they are currently accessing; namely the internet, books, GPs, and their friends.

Most infertile women who are seeking assisted conception treatment at ART clinics believe they have timed intercourse mostly within the fertile window of the menstrual cycle in their attempts at natural conception, yet they have either no knowledge of FA or poor knowledge of FA.

Most women, GPs' and PNs' believe that women should receive FA education when first presenting in general practice with trouble conceiving. However, FA education in general practice is generally poor and most is not based on the best available evidence.

Quality, evidence-informed patient educational materials and greater use of trained PNs (nurses and midwives) in FA methods are needed to improve the delivery of FA education in general practice.

A collaborative model of practice with GPs and PNs (nurses and midwives) is considered the most suitable model of practice for the delivery of FA education in general practice.

5.8 Overview of Chapter

In this chapter, the findings of the different data sets of the study were examined in the light of the literature review, then compared and contrasted to determine the areas of agreement or difference between the data sets. The study findings were generally concordant with the literature, and triangulation analysis revealed several areas of agreement between the different data sets and one area of disagreement.

The complementary nature of the findings across all data sets involving women and their PHC practitioners concerning women's understanding of FA, strengthen the research evidence that

women's poor understanding of the fertile period of the menstrual cycle may be a contributing cause of infertility (Blake et al., 1997; Hampton et al., 2012). The convergent nature of agreement across the data sets between women and their PHC practitioners that women should receive FA education when first reporting trouble conceiving lends additional strength to the research evidence. Only one area of difference or disagreement was found between the different data sets of this study. The NICE (2004) guideline recommendation (National Institute for Clinical Excellence, 2004), advising against timed intercourse in the initial assessment and treatment of infertile people was divergent from the views of most women and their PHC practitioners' in this study. However, the examination of the evidence base of the NICE (2004) recommendation raised several questions about its validity. Both the literature review and the findings of this study inform a new model of care to improve the delivery of FA education in general practice.

In the next and final chapter of this thesis, I return to the research statement that set the direction of this study and the three hypotheses that were tested.

CHAPTER SIX: CONCLUSIONS

6.1 Introduction

This chapter returns to the research statement and the three hypotheses that were tested, and draws the conclusions from the combined findings of Phase 1 and Phase 2 of this study.

The research statement that set the direction of this study is that:

Previous research has suggested that women's poor understanding of FA may be a contributing cause of infertility (Blake et al., 1997). Although correctly timed intercourse within the fertile window of the menstrual cycle may shorten time to pregnancy (Brosens et al., 2004; Colombo & Masarotto, 2000; Colombo et al., 2006; Frank-Herrmann et al., 2005; Wilcox et al., 1995) helping some couples to avoid unnecessary ART treatment (Gnoth et al., 2005; Stanford et al., 2002), an intervention to improve the delivery of FA education in general practice in the initial assessment and treatment of infertile people has not been developed.

The three hypotheses that were tested are:

1. Most infertile women who are seeking assisted conception at ART clinics cannot identify the fertile window of the menstrual cycle. However, these women have greater knowledge of FA than most women attending general practice.
2. Most GPs and PNs currently do not provide FA education, as they are educationally unprepared, having received either no training or minimal training on this topic in their undergraduate courses.
3. Practice nurses will demonstrate a greater interest in professional development than GPs to provide FA education for infertile women.

Following a summary of the main findings of this study and the conclusions about the hypotheses that were tested, the recommendations for practice are stated, study limitations and strengths are described and future research is listed.

6.2 The Main Findings and Significance of the Study

This study used a two phase mixed methods design examining FA knowledge, attitudes and practices of women and PHC practitioners as modifiable risk factors for infertility. It has shown in the Australian setting that most women who are seeking assisted conception treatment at ART clinics have a poor understanding of the time in the menstrual cycle when they are able to conceive, and strongly suggests that this may be a contributing cause of infertility (Blake et al., 1997; Hampton et al., 2012). The study has also shown that this gap in women's knowledge is largely unaddressed in general practice. Yet, most women and their PHC practitioners' believe that women should receive FA education when first reporting trouble conceiving. General practice, therefore, seems an appropriate setting for an intervention promoting couples' fertile potential through a better understanding of the time in the menstrual cycle a woman can conceive.

The proposed new model of care arising from the findings of this study aims to reduce specialist care for infertility through improved health literacy. This aim is in alignment with person-centred care (McCormack et al., 2008) and the key strategic directions of the Australian Government's health system reforms (Australian Government Department of Health and Ageing, 2010), it complements the public health campaigns being conducted by The Fertility Coalition (The Fertility Coalition, 2012), and will make a contribution towards the development of Australia's first national comprehensive sexual and reproductive health plan in which reducing infertility through an understanding of the underlying preventable causes is a key focus (Australian Women's Health Network, 2012).

The study findings have the potential for policy implications concerning the initial assessment and treatment of infertile people in general practice for the following reasons. The rising trend in increased use of ART treatment in Australia is unsustainable and jeopardises the financial sustainability of Australia's health system (Anderson, Nisenblat, et al., 2010). The success rate of ART treatment is low (Wang et al., 2011), associated with increases in iatrogenic disease (Davies et al., 2012; Henriksson et al., 2013; Reefhuis et al., 2009b), higher overall health care costs for mothers and babies (Koivurova et al., 2007) and a number of health inequities (ESHRE Capri Workshop Group, 2004; Loxton & Lucke, 2009). In addition, the extension of ART treatment to include virtually all diagnostic categories of sub-fertility is non-evidence based (Kamphuis et al., 2014), potentially contributing to both the over-use and unnecessary use of ART treatment (Eijkemans et al., 2008; Kamphuis et al., 2014).

Three hypotheses were tested in this study. A null hypothesis was rejected for the first, having found that infertile women who are seeking assisted conception treatment at ART clinics have greater knowledge of FA than most women attending general practice. A null hypothesis was not rejected for the second or the third hypotheses that were tested. For the second hypothesis, while both GPs and PNs felt educationally unprepared to provide FA education, GPs, mainly female GPs, were more likely than PNs to provide at least some FA education in general practice. For the third hypothesis, while ordered logistic regression analysis revealed greater interest in professional development in FA methods among PNs' than GPs', this was not statistically significant. However, analysis of the free-text comments offered by PNs in the practitioner survey and in the interviews did show a greater overall interest in professional development in FA methods than GPs did.

6.3 Recommendations for Practice

The findings of this study have the potential to lead to the following recommendations for practice.

Recommendation 1: Women should receive FA education when first presenting in general practice with trouble conceiving. A high degree of agreement exists between women and their PHC practitioners' that women should receive FA education when first reporting trouble conceiving, as it may help some infertile women to conceive naturally.

Recommendation 2: Professional development is needed to improve the delivery of FA education in general practice. General practitioners' and PNs' have identified that education and training in FA methods is needed to increase their knowledge, skills and confidence in the delivery of FA education. Ideally, the education would be available online for reasons relating to time, cost, convenience and accessibility, especially for those practitioners who reside outside major Australian cities.

Recommendation 3: Evidenced-based patient educational materials are needed to guide the delivery of FA education in general practice. These materials would ideally be kept up-to-date in a central location, downloadable from the internet, be culturally appropriate and in different languages.

Recommendation 4: A FA education decision-making board is needed to increase GPs' and PNs' awareness of the biomedical, social and individual circumstances in which FA education may help sub-fertile women to conceive. This is needed to increase GPs' and PNs' awareness of the myriad circumstances in which FA education may be offered as an intervention in general practice.

Recommendation 5: A quality FA education website is needed for Australian women to test the accuracy of their knowledge of FA and also to learn about FA from a trusted source of the information that is evidence informed and kept up to date. An Australian FA education website would increase women's access to trusted FA information and advice regardless geographic location. Ideally, the content of the website would complement the patient FA educational materials provided in general practice by GPs and PNs.

Recommendation 6: The NICE (2013) guideline *Fertility: assessment and treatment for people with fertility problem* should be updated to reflect the current evidence concerning women's and PHC practitioner's attitudes to timed intercourse to optimise the chance of conception. A high degree of agreement exists between women and their PHC practitioners that women should receive FA when first reporting trouble conceiving.

6.4 Future Research

In this study I was unable to measure the clinical significance of high FA in sub-fertile women. Further research is needed in a cluster RCT of the proposed intervention measuring time to pregnancy and infertility at six and 12 months between two groups of women attending general practice: one group would receive only usual preconception care; the other would receive usual preconception care plus FA education.

6.5 Study Limitations and Strengths

The findings of the consumer surveys should be considered within the limitations of the overall design. Study limitations include the relatively small sample sizes of women attending general practice and on admission to ART clinics. These samples were limited to just two ART clinics in a major city in Australia and three general practices in Victoria. The sources of these samples typically exclude a number of different groups of women; including, for example, those living in remote and very remote locations, in institutions (such as prison) and the homeless. The views of respondents may systematically differ from those of non-respondents. Whether response bias in the surveys could have influenced the results needs to be considered. Self-report and recall bias could have influenced the findings. Despite these limitations, there were a number of study strengths in the consumer surveys, including the fact that women from diverse socio-economic backgrounds were represented – high and low SES and rural – suggesting that the findings can be generalised to their target

populations. The survey response rates were relatively high, suggesting a high acceptance of this research and interest in the topic by women attending general practice and seeking fertility assistance at ART clinics. Adequate sample sizes and use of valid and reliable instruments ensured validity of the data sets.

Study limitations of the review need to be considered. The search strategy was restricted to relevant publications published in English over a 15 year period through to 2010. The search terms used may not have identified all relevant articles. The inclusion of only English language publications may have excluded potentially relevant work in other languages. The search strategy found only one relevant guideline which was for updating in 2012, thus limiting the currency of the review in this study.

The findings of the practitioner survey should be considered within the limitations of the overall design. Study limitations include the fact the views of respondents may systematically differ from those of non-respondents. Whether response bias in this survey could have influenced the results needs to be considered. For example, the higher representation of female GPs compared with male GPs may explain the relatively high levels of interest in FA education found among GPs, thus limiting the generalisability of the study findings to GPs in general. Despite these limitations, adequate sample sizes and use of a valid and reliable instrument ensured validity of the data set.

Limitations of the practitioner interviews and focus groups include the fact that the participants were recruited from only one state in Australia. The relatively small sample of GPs and PNs may have influenced the findings. The views of the GPs' and PNs' who volunteered to participate in this qualitative phase may systematically differ from those who chose not to participate. Despite these limitations there was general agreement among GPs' and PNs' about the barriers and enablers and how best to deliver FA education in general practice across all three targeted SES areas represented – high, low and rural. The inclusion of practices with high immigrant and Australian Indigenous populations strengthen the generalisability of the qualitative findings.

6.6 Study Difficulties and Future Strategies

Conducting a study based on the complex intervention framework within the limitations of a doctoral thesis was not easy to accomplish with so many different methodologies, ethical approval and grant applications to manage. To achieve the necessary academic support for the mixed methods design of the study, I sought and acquired two additional research supervisors; Associate Professors Jennifer Newton and Rhian Parker.

General practices are typically very busy workplaces and were especially so during the life of this study, as many were either evolving or preparing to evolve into Medicare Locals (MLs) under the Australian Government's health system reforms (PCHRIS, 2012). Recruiting general practices to participate in this study during this time of change either by distributing questionnaires to their patients or through the participation of GPs and PNs was difficult to accomplish. Getting past the receptionists, who rightly act as 'gatekeepers', to speak with either a GP or PN was a major difficulty. To overcome this barrier, I formulated a tightly crafted 30-second-summary of the study outlining the benefits in brief for both the practitioners and patients of their clinic. This strategy proved to be quite successful and, therefore, one I would employ in future research involving general practice.

The Human Research Ethics Committee that granted ethical approval to recruit infertile women into the study requested that additional data be collected to determine women's use of home-use fertility tests and whether women found them useful. This request resulted in two additional questions on the questionnaire; however, they were not well crafted and the data that resulted was of limited value. In future studies I would consider such requests much more carefully.

6.7 Knowledge Translation

Knowledge translation is a crucial component of health research (Grol, Wensing, & Eccles, 2005; Straus et al., 2010). Knowledge translation of this study commenced during my candidature with conference presentations, publications in journals and newsletters, and by contributing towards the development of the Practice Nurse Family Planning Capacity Building (PNFPCB) Project (The Australian Practice Nurses Association, 2011).

A total of 23 conference presentations (poster and oral) were made. Each abstract was peer-reviewed and published as a part of the conference proceedings (see Appendix 6). Print media attention was achieved in *The Age* (Medew, 2009, October 29) and *The Medical Observer: Primary Care Nurse* (Eccles, 2011, April 18) as a result of conference presentations.

Two peer-reviewed papers were published in high ranking journals: 'Should spontaneous or timed intercourse guide couples trying to conceive?' (Hampton & Mazza, 2009) and 'Fertility-awareness knowledge, attitudes and practices of infertile women' (Hampton et al., 2012) (see Appendix 5). The latter paper was widely reported during 'National Fertility- Awareness Week' 2012 (September 3-9) across Australia in 11 print media outlets and internationally in seven in France, the United Kingdom and in the United States. Two community radio interviews resulted from the print media exposure. In addition, summaries of different aspects of the study have been published in number of Australian nursing journals and newsletters.

In 2011, the Australian Practice Nurses Association received a grant for the Practice Nurse Family Planning Capacity Building (PNFPCB) Project under the Australian Government Department of Health and Ageing (DoHA) Family Planning Grants Program (The Australian Practice Nurses Association, 2011). The project aimed to promote the role of the nurse in general practice in the provision family planning services. A result of this doctoral study, I was invited to become a member

of the Expert Working Committee of the PNFPCB project. The article 'Fertility-awareness knowledge, attitudes and practices of infertile women' (Hampton et al., 2012) informed this professional development event for nurses in general practice.

6.8 Concluding Summary

In conclusion, infertility is an important health issue in Australia affecting one in six couples (Loxton & Lucke, 2009). Despite the fact that infertility is a complex health issue that may involve biomedical, behavioural and social risk factors (Haywood, 2009; Macaluso et al., 2010; Tingen et al., 2004), tertiary level care, which is intrusive, expensive, and associated with increases in morbidity and mortality for both mothers and babies, has become the most preferred treatment option in Australia (Kamphuis et al., 2014). Further concerns are that the extension of ART treatment to include virtually all diagnostic categories of sub-fertility is not evidence-based (Kamphuis et al., 2014), and ART treatment is associated with a number of health inequities among different population groups of infertile people (Loxton & Lucke, 2009).

While the complexity of infertility demands a range of well integrated models of service delivery across the continuum of care for care to be appropriate to the level of need, this study has identified that infertility is poorly addressed in primary care, and that a new model of care is needed in general practice targeting all known modifiable risk factors with the aim of reducing infertility in infertile people before they are referred on to ART clinics. Poor lifestyles (Anderson, Nisenblat, et al., 2010) and advanced maternal age (Australian Bureau of Statistics, 2008a) are known risk factors for infertility that should be addressed in general practice. This study fills a gap in our current knowledge concerning FA as it may relate to infertility, and extends our understanding of modifiable risk factors that should be addressed when women first report trouble conceiving. A health system that emphasises PHC would address all known modifiable risk factors for infertility in a comprehensive model of care in primary care before referring infertile people on to ART clinics.

Importantly, in this study, I have not argued against the judicious use of ART treatment, as I consider ART treatment essential health care for infertile people with proven need. However, it is my contention that because ART treatment is highly invasive, expensive and associated with increases in morbidity and mortality for both mothers and babies, I believe that all women who present in general practice with trouble conceiving should be supported to optimise their fertile potential naturally. That research evidence suggests an association between ART treatment and excess risk for birth defects, cancers in mothers and babies and some rare syndromes in children, even though a causal link has not been demonstrated (Reddy, 2007) are additional compelling reasons for the judicious use of ART treatment.

This study completes the essential first step of the complex intervention framework to improve health care; developing a theory (Pre-clinical) (Medical Research Council, 2008). Whilst it is anticipated that this study will lead to an intervention to improve the delivery of FA education in the initial assessment and treatment of infertile people in general practice, further research is needed before this can be recommended. The next steps of research include a feasibility study of the intervention (Phase I of complex intervention framework), then a pilot study of the intervention (Phase II of complex intervention framework), followed by a cluster RCT of the intervention (Phase III of complex intervention framework) (Medical Research Council, 2008). Evaluation would include patient satisfaction and a cost benefit analysis of the intervention. A RCT is needed to establish the clinical significance of high FA in sub-fertile women. Not until high quality research, such as a RCT, demonstrates the benefits of the proposed intervention should the findings of this study be translated into clinical practice and health policy (Campbell, 2007; Glasziou et al., 2010; Medical Research Council, 2008; Snick, 2005).

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LIST OF APPENDICES

Appendix 1: Ethics Approval

Project Numbers and Approval Dates

Study Phases	Date Approved	Project Number
<i>Phase 1</i>		
Fertility-awareness among women attending a specialist fertility service	4 th of December 2007	MUHREC: CF07/2800 - 2007001718
A survey of fertility-awareness of women aged 18 to 44 attending three general practices in Victoria	15 th of September 2008	MUHREC: CF08/2008 - 2008000979
<i>Phase 2</i>		
Developing an intervention to improve the fertility-awareness of sub-fertile women in general practice	11 TH of August 2011	MUHREC: CF11/2246 - 2011001268

Appendix 2: Questionnaires

Fertility-Awareness Questionnaire – Women on Admission to ART Clinics

Please tick your answers to the questions below or write in the space provided.

1. Have you had at least one period in the last six months?

- ₁ Yes ₂ No

If you answered ‘No’ to having at least one period in the last six months, thank you for your time, but please place your questionnaire in the collection box provided as we are surveying women who would normally experience signs of ovulation. Otherwise, proceed to question 2.

2. Please tick your age range.

- ₁ 25 years or less ₂ 26 – 35 years ₃ 36 years or older

3. What is the highest educational level you have attained?

- ₁ Completed primary school ₂ Completed secondary school
₃ Completed a TAFE course ₄ Completed a university degree

4. How long have you been trying to get pregnant?

- ₁ less than 1 year ₂ 1-2 years ₃ 3 years or more

5. How many times did you consult a general practitioner about your difficulty getting pregnant before you were referred to a fertility specialist?

- ₁ Once only ₂ 2-3 times ₃ 4 times or more

6. How many times have you consulted a fertility specialist?

- ₁ Once only ₂ 2-3 times ₃ 4 times or more

7. Have you been told the cause(s) of your fertility difficulty?

- ₁ Yes ₂ No

If you answered ‘Yes’, please tick what you have been told is the cause of your infertility. You may tick more than one box.

- ₁ Endometriosis.....
₂ Polycystic ovary syndrome or ovulation problems
₃ Blocked fallopian tubes
₄ Male factor fertility problems.....
₅ Male and female factor fertility problems
₆ Unexplained infertility
₇ Other.....
.....
.....

8. On average how long is your menstrual cycle? (A menstrual cycle is counted from the beginning of one period through to the beginning of the next.)

- ₁ 26 days or less ₂ 27-35 days ₃ >35 days ₄ Irregular

9. Are you aware of the fertile time in your menstrual cycle?

₁ Often ₂ Sometimes ₃ Never

If you answered 'Never', please proceed to question 17.

If you answered 'Yes', please write which days of your menstrual cycle are the fertile days counting from the first day of the period

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10. When you and your partner were trying to get pregnant, did you have sex at:

₁ Any time in the cycle ₂ Mainly during the fertile time ₃ Not sure

11. Are you ever aware of ovulation pain?

₁ Often ₂ Sometimes ₃ Never

If you are aware of ovulation pain, please write on which day(s) of the menstrual cycle the pain occurs counting the first day of the period as day one.

12. Are you aware of changes in vaginal mucus secretions?

₁ Often ₂ Sometimes ₃ Never

If you are 'Never' aware, please proceed to question 13.

A. Do you know which mucus type indicates the fertile time?

₁ Yes ₂ No

B. If you answered 'Yes' please tick the type that indicates the fertile time.

₁ Clear mucus ₂ Thick mucus ₃ Wet mucus ₄ Pasty mucus

C. Can you describe the mucus change that indicates the beginning of the fertile time in your menstrual cycle?

₁ Yes ₂ No

If you answered 'Yes', please describe the change that indicates the beginning of the fertile time in your menstrual cycle

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D. Can you describe the mucus change that indicates ovulation and the end of the fertile time in your menstrual cycle?

₁ Yes ₂ No

If you answered 'Yes', please describe the mucus change that indicates ovulation and the end of the fertile time in your menstrual cycle

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.....
.....

E. Have you ever documented mucus changes over three or more menstrual cycles?

₁ Yes ₂ No

13. Have you ever used the temperature method?

- ₁ Yes ₂ No

If you answered 'No', please proceed to Question 14.

A. Please tick the temperature change that indicates ovulation has occurred:

- ₁ A temperature drop ₂ A temperature rise
₃ A sustained temperature rise ₄ Not sure

B. Based on the temperature method a woman is most fertile:

- ₁ When the temperature drops ₂ After the temperature has risen
₃ At the bottom of the sustained temperature rise ₄ Not sure

C. Have you ever documented three or more menstrual cycles with the temperature method?

- ₁ Yes ₂ No

14. Have you ever used a saliva-based fertility tester to identify your fertile time?

- ₁ Yes ₂ No

A. If you answered 'Yes', how many months did you use the tester for and did you find it useful?

- ₁ Yes ₂ No

15. Have you ever used urine tests to identify ovulation in your menstrual cycles?

- ₁ Yes ₂ No

A. If you answered 'Yes', how many months did you use them for and did you find them useful?

- ₁ Yes ₂ No

16. Since you have been trying to get pregnant have you actively tried to increase your awareness of the fertile time in your menstrual cycles?

- ₁ Yes ₂ No

A. If you answered 'Yes', please tick if you sought the information from any of the following sources. (You may tick more than one box.)

- ₁ Book ₂ General practitioner ₃ Natural fertility teacher
₄ Friend ₅ Internet ₆ IVF clinic
₇ Other, please state

.....
.....

17. Please consider the following statements and tick your response.

A. A women should receive education to increase her awareness of the fertile time in her menstrual cycle when she first reports difficulty in getting pregnant to her GP

- ₁ Strongly agree ₂ Agree ₃ Undecided ₄ Disagree ₅ Strongly disagree

B. Timing sexual intercourse with the fertile time in a woman's menstrual cycle can help some infertile couples to get pregnant naturally!

- ₁ Strongly agree ₂ Agree ₃ Undecided ₄ Disagree ₅ Strongly disagree

Fertility-Awareness Questionnaire – Women Attending General Practice

Please tick your answers to the questions below or write in the space provided.

1. Are you currently using any of the following methods of contraception? (You may tick more than one method.)

₁ Yes ₂ No

If you answered 'No', please proceed to question 2.

- | | |
|--|---|
| <input type="checkbox"/> ₁ Oral Contraceptive Pill | <input type="checkbox"/> ₂ Male Condom |
| <input type="checkbox"/> ₃ Spermicide | <input type="checkbox"/> ₄ Implanon |
| <input type="checkbox"/> ₅ Injection (Depo-Provera) | <input type="checkbox"/> ₆ Withdrawal |
| <input type="checkbox"/> ₇ Female Condom | <input type="checkbox"/> ₈ Diaphragm or Cervical Cap |
| <input type="checkbox"/> ₉ Tubal Ligation | <input type="checkbox"/> ₁₀ Vaginal Ring (NuvaRing) |
| <input type="checkbox"/> ₁₁ Contraceptive Sponge | <input type="checkbox"/> ₁₂ Vasectomy |
| <input type="checkbox"/> ₁₃ Intrauterine Device (such as the Copper IUD or Mirena) | |
| <input type="checkbox"/> ₁₄ Natural Birth Control (i.e. Mucus, Temperature or Rhythm Methods) | |
| <input type="checkbox"/> ₁₅ I am using a combination of natural methods (i.e. natural birth control methods with condoms or withdrawal) | |

2. Please tick your age range.

₁ 25 years or less ₂ 26 – 35 years ₃ 36 years or older

3. What is the highest educational level you have attained?

₁ Completed primary school ₂ Completed secondary school
₃ Completed a TAFE course ₄ Completed a university degree

4. Please tick the circumstance that best describes your situation.

₁ I have completed my family ₂ I plan to have children in the future
₃ I have no plans to have children ₄ I am currently planning a pregnancy
₅ I am currently pregnancy

5. On average over the last year how long are your menstrual cycles? (A menstrual cycle is counted from the beginning of one period through to the beginning of the next.)

₁ 26 days or less ₂ 27-35 days ₃ >35 days
₄ Irregular ₅ No period in last six months

If you answered 'No period in last six months', please state the why you have not had a period in the last six months.....

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.....

6. Are you aware of the fertile time in your menstrual cycle?

₁ Often ₂ Sometimes ₃ Never

If you answered 'Never', please proceed to question 13.

If you answered 'Yes', please write which days of your menstrual cycle are the fertile days counting from the first day of the period

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.....

7. Are you ever aware of ovulation pain?

- ₁ Often ₂ Sometimes ₃ Never

If you are aware of ovulation pain, please write on which day(s) of your menstrual cycle the pain occurs counting from the first day of the period.....

.....
.....

8. Are you aware of changes in vaginal mucus secretions?

- ₁ Often ₂ Sometimes ₃ Never

If you are 'Never' aware, please proceed to question 9.

A. Do you know which mucus type indicates the fertile time?

- ₁ Yes ₂ No

B. If you answered 'Yes' please tick the mucus type that indicates the fertile time.

- ₁ Clear mucus ₂ Thick mucus ₃ Wet mucus ₄ Pasty mucus

C. Can you describe the mucus change that indicates the beginning of the fertile time in the menstrual cycle?

- ₁ Yes ₂ No

If you answered 'Yes', please describe the mucus change that indicates the beginning of the fertile time in your menstrual cycle.....

.....
.....
.....

D. Can you describe the mucus change that indicates ovulation and the end of the fertile time in a menstrual cycle?

- ₁ Yes ₂ No

If you answered 'Yes', please describe the mucus change that indicates ovulation and the end of the fertile time in your menstrual cycle

.....
.....
.....

E. Have you ever documented mucus changes over three or more menstrual cycles?

- ₁ Yes ₂ No

9. Have you ever used the temperature method?

- ₁ Yes ₂ No

If you answered 'No', please proceed to Question 10.

A. Please tick the temperature change that indicates ovulation has occurred:

- ₁ A temperature drop ₂ A temperature rise
₃ A sustained temperature rise ₄ Not sure

B. Based on the temperature method a woman is fertile:

- ₁ when the temperature drops ₂ after the temperature has risen
₃ at the bottom of the sustained temperature rise ₄ not sure

C. Have you ever documented three or more menstrual cycles with the temperature method?

₁ Yes ₂ No

10. Have you ever used a saliva-based fertility tester to identify the fertile time?

₁ Yes ₂ No

A. If you answered 'Yes', how many months did you use the tester for and did you find it useful?

₁ Yes ₂ No

11. Have you ever used urine tests to identify ovulation in the menstrual cycles?

₁ Yes ₂ No

A. If you answered 'Yes', how many months did you use them for and did you find them useful?

₁ Yes ₂ No

12. Have you ever actively tried to increase your awareness of the fertile time in the menstrual cycles?

₁ Yes ₂ No

A. If you answered 'Yes', please tick if you sought the information from any of the following sources. (You may tick more than one box.)

₁ Book ₂ General practitioner ₃ Natural fertility teacher ₄ Friend
₅ Internet ₆ IVF clinic ₇ Other, please state
.....
.....

13. Please consider the following statements and tick your response.

A. A women should receive education to increase her awareness of the fertile time in her menstrual cycle when she first reports to her GP difficulty in getting pregnant!

₁ Strongly agree ₂ Agree ₃ Undecided ₄ Disagree ₅ Strongly disagree

B. Timing sexual intercourse with the fertile time in a woman's menstrual cycle can help some infertile couples to get pregnant naturally!

₁ Strongly agree ₂ Agree ₃ Undecided ₄ Disagree ₅ Strongly disagree

14 A. Has your GP ever discussed fertility-awareness methods to help you identify the fertile time in the menstrual cycle?

₁ Yes ₂ No

B. If you answered 'Yes', please sate the reason (You may tick more than one box.)

₁ Contraception
₂ Helping you to optimize the chances of getting pregnant
₃ Other, please specify
.....
.....

Are there any comments you would like to make in relation to this questionnaire?

.....
.....

Fertility-Awareness Assessment Sheet

Please circle the score that corresponds to the assessment.

1. None - No fertility-awareness

Question 6. Answer 'Never'

2. Poor - Fertility-awareness is based on 'rhythm' and/or perceived ovulation pain

Question 6. Answer 'Sometimes'

Question 7. Answer 'Sometimes' or 'Often'

Question 8. Answer 'Sometimes' or 'Never'

Question 8A. Answer 'No'

Question 8B. Answer 'Thick Mucus' or 'Pasty Mucus'

Question 8C. Answer 'No' or 'Yes', but does not describe the mucus change

Question 8D. Answer 'No' or 'Yes', but does not describe the mucus change

Question 8E. Answer 'No'

Question 9. Answer 'No'

3. Moderate - Fertility-awareness is based on either a poor understanding mucus changes or an accurate understanding of mucus changes but has not documented 3 or more menstrual cycles with the mucus method

Question 6. Answer 'Often'

Question 8. Answer 'Often'

Question 8A. Answer 'Yes'

Question 8B. Answer 'Clear Mucus' or 'Wet Mucus'

Question 8C. Answer 'No'; or 'Yes' but does not describe the mucus change

Question 8D. Answer 'No' or 'Yes' but does not describe mucus change

Question 8E. Answer 'No'

4. High - Fertility-awareness is based on an accurate understanding of either the mucus method or the temperature method and a minimum of 3 menstrual cycles have been documented with either method

Question 6. Answer 'Often'

Question 8. Answer 'Often'

Question 8A. Answer 'Yes,'

Question 8B. Answer 'Clear Mucus' or 'Wet Mucus'

Question 8C. Answer 'Yes' and accurately describes the mucus change

Question 8D. Answer 'Yes' and accurately describes the mucus change

Question 8E. Answer 'Yes'

Question 9. Answer 'Yes',

Question 9A. Answer 'a sustained temperature rise'

Question 9B. Answer 'at the bottom of the sustained temperature rise'

Question 9C. Answer 'Yes'

.../4 Score



National Survey of General Practitioners and Practice Nurses

Assisting Women Presenting in General Practice to Conceive

This is a brief 5-minute survey looking at how women presenting in general practice can be assisted to conceive. We define fertility-awareness (FA) as a woman’s ability to recognise the signs and symptoms of the fertile days of the menstrual cycle. There are three FA methods - rhythm, temperature and mucus.

Thank you for taking the time to complete this questionnaire. Please write your name and contact details in the tear-off section at the end if you wish to be placed in the draw to win one of three iPod Shuffles 2GB. This section will be removed on receipt of the questionnaire rendering it anonymous.

Please answer each question by placing a ✓ in the appropriate box (☐) or writing in the space provided.

1. What is your current practice when a woman presents who states she is having trouble conceiving?

Please tick your response to each of the following.

- 1. I order blood tests for the woman ₁ Always ₂ Usually ₃ Sometimes ₄ Rarely ₅ Never
- 2. I order a semen analysis for her partner ₁ Always ₂ Usually ₃ Sometimes ₄ Rarely ₅ Never
- 3. I immediately refer to a fertility specialist ₁ Always ₂ Usually ₃ Sometimes ₄ Rarely ₅ Never
- 4. I provide FA counselling ₁ Always ₂ Usually ₃ Sometimes ₄ Rarely ₅ Never
- 5. Other, please specify.....

2. If you do provide FA counselling, which of the following FA methods do you recommend?

Please tick your response to each method.

- 1. Rhythm method ₁ Always ₂ Usually ₃ Sometimes ₄ Rarely ₅ Never
- 2. Mucus method ₁ Always ₂ Usually ₃ Sometimes ₄ Rarely ₅ Never
- 3. Temperature method ₁ Always ₂ Usually ₃ Sometimes ₄ Rarely ₅ Never
- 4. Other, please specify.....

3. From the list below, which of the following sources of FA information do you recommend for women who are having trouble conceiving? Please tick your response to each of the following.

- I personally provide FA instruction ₁ Always ₂ Usually ₃ Sometimes ₄ Rarely ₅ Never
- I refer to trained teachers ₁ Always ₂ Usually ₃ Sometimes ₄ Rarely ₅ Never
- I recommend books or pamphlets ₁ Always ₂ Usually ₃ Sometimes ₄ Rarely ₅ Never
- I recommend the internet ₁ Always ₂ Usually ₃ Sometimes ₄ Rarely ₅ Never
- I refer to IVF clinics ₁ Always ₂ Usually ₃ Sometimes ₄ Rarely ₅ Never
- I refer to a nurse with an interest in this area ₁ Always ₂ Usually ₃ Sometimes ₄ Rarely ₅ Never
- I refer to a GP with an interest in this area ₁ Always ₂ Usually ₃ Sometimes ₄ Rarely ₅ Never
- Other, please specify

4. When accurately understood and applied, how effective do you think the following FA methods are in assisting women to conceive? Please tick your response to each method.

- Rhythm method ₁ Very high ₂ High ₃ Moderately ₄ Low ₅ Not at all
 Mucus method ₁ Very high ₂ High ₃ Moderately ₄ Low ₅ Not at all
 Temperature method ₁ Very high ₂ High ₃ Moderately ₄ Low ₅ Not at all

5. Overall, how do you rate women’s knowledge of the fertile time of the menstrual cycle?

- ₁ Very high ₂ High ₃ Moderate ₄ Low ₅ Very low

6. Overall, how do you rate your knowledge of FA methods?

- ₁ Very high ₂ High ₃ Moderate ₄ Low ₅ Very low

7. The temperature method indicates ovulation in the menstrual cycle by a change in the basal body temperature (BBT). Please tick the BBT change that you think indicates the occurrence of ovulation in the menstrual cycle.

- ₁ A temperature drop ₂ A temperature rise
₃ A sustained temperature rise ₄ Not sure

8. Based on the BBT change, please tick the time in the menstrual cycle when a woman is most fertile.

- ₁ When the temperature drops ₂ After the temperature has risen
₃ Just before the sustained temperature rise ₄ Not sure

9. Do you know which mucus type indicates the fertile time of the menstrual cycle?

- ₁ Yes ₂ No ₃ Not sure

10. If you answered ‘Yes’ to Question 9, please tick the mucus type that indicates the fertile time.

- ₁ Thick yellow/white mucus ₂ Tacky/creamy mucus ₃ Clear/slippery mucus

11. Please tick your response to the following two statements.

A. Timing sexual intercourse within the fertile time of the menstrual cycle can help some infertile couples to conceive.

- ₁ Strongly agree ₂ Agree ₃ Undecided ₄ Disagree ₅ Strongly disagree

B. FA education should be provided in general practice for couples having trouble who are having trouble conceiving.

- ₁ Strongly agree ₂ Agree ₃ Undecided ₄ Disagree ₅ Strongly disagree

C. A UK guideline for people with fertility problems states that “Timing intercourse to coincide with ovulation causes stress and is not recommended.”

- ₁ Strongly agree ₂ Agree ₃ Undecided ₄ Disagree ₅ Strongly disagree

12 A. If you ‘Strongly agree’ or ‘Agree’ with Statement 11B, who do you think should provide the education? Please rank the following practitioners in order of preference by placing a number of 1 to 4 in the box. (1- most preferred; 4- least preferred).

- General practitioner
 Practice nurse
 Women’s nurse/midwife
 Other, please specify.....

12 B. If you ‘Disagree’ or ‘Strongly disagree’ with Statement 11B, please indicate your reasons.

Please tick all that apply.

- ₁ I do not have the time to provide this education
 - ₂ I do not have the necessary knowledge to provide this education
 - ₃ I do not have the necessary resources to provide this education
 - ₄ Lack of reimbursement for providing this education
 - ₅ Other, please specify.....
-
-

13. Would you like to learn more about FA methods? *Please circle your answer.*

Most definitely			Undecided			Definitely not
1	2	3	4	5	6	7

14. In your undergraduate training did you receive any education about FA methods?

- ₁ Yes
- ₂ No

15. Your gender.

- ₁ Male
- ₂ Female

16. Your age group

- ₁ Less than 35 years
- ₂ 35-44 years
- ₃ 45-54 years
- ₄ 55-64 years
- ₅ 65 years +

Are there any comments that you would like to make in relation to this questionnaire?

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Appendix 3: Explanatory Statements



Explanatory Statement: Women Seeking Fertility Assistance

4th of December 2007

Fertility-Awareness among Women-Attending a Specialist Fertility Service for Infertility

This information sheet is for you to keep. My name is Kerry Hampton and I am conducting a research project under the supervision of Danielle Mazza an Associate Professor of the Department of General Practice School of Primary Health Care at Monash University. The study is part of a research fellowship funded by Victorian Primary Health Care Research, Evaluation and Development (VICPHRED) and this means that I will be writing a research paper for publication about fertility-awareness.

Eligibility

We want to survey women who are attending this specialist fertility service for the very first time and who have had at least one period in the last six months. Please do not complete this survey if you have attended this service before or not had at least one period in the last six months. Unfortunately an interpreter is not available to translate this survey. However if you feel comfortable completing it even though your first language is not English, then you are invited to participate.

Purpose and background

The aim of this study is to find out about fertility-awareness knowledge and practices among women who have been trying to get pregnant before they attend a specialist fertility service.

Possible benefits and possible risks

There are no likely benefits to you of your participation in this study. However the results may increase knowledge about fertility-awareness and the ways in which women use this to increase their chance of conceiving. We do not anticipate any adverse affects as a consequence of this study but some of the questions asked are of an intimate and personal nature and may be perceived as intrusive. Please contact the researcher if you have any questions or concerns.

Your consent

Participation in this study is entirely voluntary and you are under no obligation to participate. If you choose not participate, your care will not be affected in any way. Returning your completed survey will imply your consent to participate in this study. If you decide to withdraw your participation, this would only be possible prior to returning your survey as it contains no identifying information that would enable it to be retrieved.

Your participation

Your participation involves completing an anonymous survey and placing it in the collection box provided at reception or returning it in the pre-paid addressed envelope. It should take no longer than seven minutes of your time and can be completed while you wait for your appointment or at home if you prefer.

Payment

You will not be paid for your participation in this study.

Privacy, confidentiality and disclosure of information

Your answers to the questions are confidential and anonymous as they contain no identifiable information that can be traced back to you.

Storage of data

Returned surveys will be kept in a locked cupboard for 5 years on Monash University premises. Electronic data will be secured by an access code. Only the researchers will have access to the data.

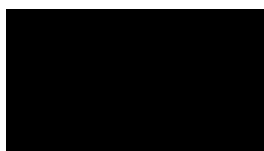
Results of research

If you would like to be informed of the study’s findings, please contact Kerry Hampton. It is anticipated that the findings will be available from the end of February 2008.

Louise Grey, Human Research Ethics Committee Coordinator, Epworth Health Care, can also be contacted if you would like to discuss any aspect of this study. Contact phone number is 9426 6281.

If you would like to contact the researchers about any aspect of this study, please contact the Chief Investigator:	If you have any complaints about any aspects of this research <CF07/2800-2007001718> or any questions about your rights as a research participant, please contact:
Kerry Hampton Department of General Practice School of Primary Care Faculty of Medicine, Nursing and Health Sciences Building 1, 270 Ferntree Gully Road Notting Hill, 3168 [Redacted] [Redacted]	Human Ethics Officer Standing Committee on Ethics in Research Involving Humans (SCERH) Building 3e Room 111 Research Office Monash University VIC 3800 [Redacted] [Redacted]

Thank you for your time and participation.



Kerry Hampton
VICPHRED Fellow
Monash University
School of Primary Health Care
Faculty of Medicine, Nursing and Health Sciences
Building 1, 270 Ferntree Gully Road, Notting Hill, 3168



Explanatory Statement: Women Attending General Practice

13th of January 2009

A survey of fertility-awareness among women aged 18-44 attending three general practices in Victoria (Australia)

This information sheet is for you to keep. My name is Kerry Hampton and I am conducting a research project with Danielle Mazza, an Associate Professor in the Department of General Practice School of Primary Health Care, towards a Master of Philosophy at Monash University. This means I will be writing a thesis, which is the equivalent of a 300-page book. We received the Elizabeth Hulme Research Grant from the Australian Nursing Federation (Vic Branch) for this study.

For this study, we chose three general practices in Victoria to survey women across a range of socio-demographic areas.

The aim/purpose of the research

The aim of this study is to find out about fertility-awareness knowledge and practices among women attending general practices in Victoria.

Possible benefits

There are no likely benefits to you of your participation in this study. However, the results may increase knowledge about fertility-awareness and the ways in which women use this to increase their chance of conceiving.

What does the research involve?

Your participation involves completing an anonymous survey and placing it in the collection box or returning it in the reply pre-paid envelope provided. The survey can be completed while you wait for your appointment or at home if you prefer.

How much time will the research take?

It should take no longer than five minutes of your time to complete the survey.

Inconvenience/discomfort

We do not anticipate that you will experience any adverse consequences from your participation, but some of the questions asked are of an intimate and personal nature and may be perceived as intrusive. Please contact the researcher if you have any questions or concerns.

Payment

You will not be paid for your participation in this study.

Can I withdraw from the research?

Being in this study is voluntary and you are under no obligation to consent to participation. However, if you do consent to participate, you may only withdraw prior to the questionnaire being submitted.

Confidentiality

Your answers to the questions are confidential and anonymous as they contain no identifiable information that can be traced back to you.

Storage of data

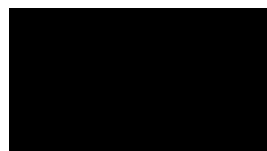
Storage of the data collected will adhere to the University regulations and kept on University premises in a locked cupboard/filing cabinet for 5 years. A report of the study may be submitted for publication, but individual participants will not be identifiable in such a report.

Results

If you would like to be informed of the aggregate research findings, please contact Kerry Hampton on 03 8575 2248 or fax 03 8575 2233. The findings will be available from the end of June 2009.

<p>If you would like to contact the researchers about any aspect of this study, please contact the Chief Investigator:</p>	<p>If you have a complaint concerning the manner in which this research <CF08/2008-2008000979> is being conducted, please contact:</p>
<p>Danielle Mazza Department of General Practice School of Primary Care Faculty of Medicine, Nursing and Health Sciences Building 1, 270 Ferntree Gully Road Notting Hill, 3168 [REDACTED] [REDACTED] [REDACTED]</p>	<p>Executive Officer, Human Research Ethics Standing Committee on Ethics in Research Involving Humans (SCERH) Building 3e Room 111 Research Office Monash University VIC 3800 [REDACTED] [REDACTED] [REDACTED]</p>

Thank you for your time and participation.



Kerry Hampton
 MPhil (Research) Candidate
 Department of General Practice
 School of Primary Health Care
 Faculty of Medicine, Nursing and Health Sciences
 Building 3, 270 Ferntree Gully Road, Notting Hill, 3168
 Phone: 03 9902 4516



Explanatory Statement: Practice Nurses

1ST of October 2011

Assisting Women Presenting in General Practice to Conceive

This information sheet is for you to keep. My name is Kerry Hampton and I am conducting a research project with Prof Danielle Mazza, Dr Jennifer Newton and A/Prof Rhian Parker in the Department of General Practice, Monash University, towards a PhD (Research). This study is funded by the 2011 Annie Sage Memorial Scholarship (Royal College of Nursing, Australia).

This is a brief 7-minute survey looking at how to assist women presenting in general practice to conceive. We define fertility-awareness as a woman's ability to recognise the signs and symptoms of the fertile days of the menstrual cycle. There are three FA methods - rhythm, temperature and mucus.

Eligibility

We want to survey general practitioners and practice nurses working in diverse locations across Australia to gather information about their fertility-awareness knowledge, attitudes, and practices. This online survey is for practice nurses only. General practitioners will be surveyed separately using a postal survey.

Aims

The aims of this study are to find out: (i) what general practitioners and practice nurses know about fertility-awareness methods, (ii) if they think fertility-awareness education should be provided for sub-fertile women in the general practice setting, (iii) who they think should provide this education, (iv) and if they would like to learn more about this topic.

Possible benefits

There are no likely benefits to you directly for your participation in this study. However, it may lead to the development of a new model of care that assists women presenting in general practice to conceive.

Your consent

Participation in this study is entirely voluntary; you are under no obligation to participate. If you decide to withdraw your participation, this would only be possible prior to returning the questionnaire. Please note that if you provide your contact details to go into the draw to win one of three iPods, they will be removed on receipt of the completed questionnaire rendering it anonymous.

Your participation

Your participation involves completing a self-administered questionnaire. It should take no longer than 5 minutes of your time.

Inconvenience, discomfort or possible harm

There are no expected risks such as increased stress or inconvenience or discomfort beyond that experienced in everyday life from participating in this study. However, the research team is available should you wish to discuss any concerns.

Inclusion/exclusion criteria

General practitioners and practice nurses currently working in general practice within Australia are invited to participate in this study.

Payment

You will not be paid for your participation in this study. However, you may go into the draw to win one of three iPods shuffle 2GB for returning your completed questionnaire.

Privacy, confidentiality and disclosure of information

If you do provide your contact details to go into the draw, they will be removed on receipt of your completed questionnaire rendering it anonymous.

Storage of data

All data will be stored according to Monash University regulations. As such, all returned questionnaires will be kept in a locked cupboard for 5 years on Monash University premises. Electronic data will be secured by an access code. Only the researchers will have access to the data.

Use of data for other purposes

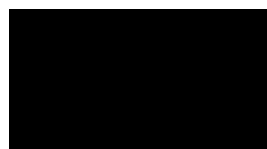
The results of this study may be submitted for publication as a journal article and/or presented at medical, nursing or scientific conferences. All data is reported in aggregate form only.

Results of research

If you would like to be informed of the study's findings, please contact Kerry Hampton at kerry.hampton@monash.edu. It is anticipated that the findings will be available from the end of February 2012.

If you would like to contact the researchers about any aspect of this study, please contact the Chief Investigator:	If you have any complaints about any aspects of this research <CF11/2246 - 2011001268 > or any questions about your rights as a research participant, please contact:
Professor Danielle Mazza Department of General Practice School of Primary Health Care Faculty of Medicine, Nursing and Health Sciences Building 3, 270 Ferntree Gully Road Notting Hill, 3168 [Redacted]	Executive Officer Monash University Human Research Ethics Committee (MUHREC) Building 3e Room 111 Research Office Monash University VIC 3800 [Redacted]

Thank you for your time and participation.



Kerry Hampton
PhD (Research) Candidate
Monash University
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School of Primary Health Care
Faculty of Medicine, Nursing and Health Sciences
Building 3, 270 Ferntree Gully Road, Notting Hill, 3168
Phone: 03 9902 4516



Explanatory Statement: General Practitioners

1ST of October 2011

Assisting Women Presenting in General Practice to Conceive

This information sheet is for you to keep. My name is Kerry Hampton and I am conducting a research project with Prof Danielle Mazza, Dr Jennifer Newton and A/Prof Rhian Parker in the Department of General Practice, Monash University, towards a PhD (Research). This study is funded by the 2011 Annie Sage Memorial Scholarship (Royal College of Nursing, Australia).

This is a brief 7-minute survey looking at how to assist women presenting in general practice to conceive. We define fertility-awareness as a woman's ability to recognise the signs and symptoms of the fertile days of the menstrual cycle. There are three FA methods - rhythm, temperature and mucus.

Eligibility

We want to survey general practitioners and practice nurses working in diverse locations across Australia to gather information about their fertility-awareness knowledge, attitudes, and practices. This postal survey is to be completed by general practitioners only. Practice nurses will be surveyed separately using an online survey through the Australian Practice Nurses Association (APNA).

Aims

The aims of this study are to find out: (i) what general practitioners and practice nurses know about fertility-awareness methods, (ii) if they think fertility-awareness education should be provided for sub-fertile women in the general practice setting, (iii) who they think should provide this education, (iv) and if they would like to learn more about this topic.

Possible benefits

There are no likely benefits to you directly for your participation in this study. However, it may lead to the development of a new model of care that assists women presenting in general practice to conceive.

Your consent

Participation in this study is entirely voluntary; you are under no obligation to participate. If you decide to withdraw your participation, this would only be possible prior to returning the questionnaire. Please note that if you provide your contact details to go into the draw to win one of three iPods, they will be removed on receipt of the completed questionnaire rendering it anonymous.

Your participation

Your participation involves completing a self-administered questionnaire. It should take no longer than 5 minutes of your time.

Inconvenience, discomfort or possible harm

There are no expected risks such as increased stress or inconvenience or discomfort beyond that experienced in everyday life from participating in this study. However, the research team is available should you wish to discuss any concerns.

Inclusion/exclusion criteria

General practitioners and practice nurses currently working in general practice within Australia are invited to participate in this study.

Payment

You will not be paid for your participation in this study. However, you may go into the draw to win one of three iPods shuffle 2GB for returning your completed questionnaire.

Privacy, confidentiality and disclosure of information

If you do provide your contact details to go into the draw, they will be removed on receipt of your completed questionnaire rendering it anonymous.

Storage of data



All data will be stored according to Monash University regulations. As such, all returned questionnaires will be kept in a locked cupboard for 5 years on Monash University premises. Electronic data will be secured by an access code. Only the researchers will have access to the data.

Use of data for other purposes

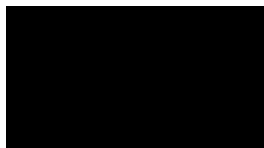
The results of this study may be submitted for publication as a journal article and/or presented at medical, nursing or scientific conferences. All data is reported in aggregate form only.

Results of research

If you would like to be informed of the study’s findings, please contact Kerry Hampton at kerry.hampton@monash.edu. It is anticipated that the findings will be available from the end of February 2012.

If you would like to contact the researchers about any aspect of this study, please contact the Chief Investigator:	If you have any complaints about any aspects of this research <CF11/2246 - 2011001268 > or any questions about your rights as a research participant, please contact:
Professor Danielle Mazza Department of General Practice School of Primary Health Care Faculty of Medicine, Nursing and Health Sciences Building 3, 270 Ferntree Gully Road Notting Hill, 3168 	Executive Officer Monash University Human Research Ethics Committee (MUHREC) Building 3e Room 111 Research Office Monash University VIC 3800 

Thank you for your time and participation.



Kerry Hampton
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School of Primary Health Care
Faculty of Medicine, Nursing and Health Sciences
Building 3, 270 Ferntree Gully Road, Notting Hill, 3168
Phone: 03 9902 4516



Explanatory Statement: General Practitioners

30th of March 2012

Exploring the barriers and enablers of fertility-awareness education for infertile women in general practice

Fertility-awareness is defined as a woman's ability to recognise the signs and symptoms of the fertile days of the menstrual cycle.

My name is Kerry Hampton and I am conducting a research project with Prof Danielle Mazza, Dr Jennifer Newton and A/Prof Rhian Parker in the Department of General Practice towards a PhD (Research) at Monash University. This means I will be writing a thesis which is equivalent to a 300 page book.

Recent Australian studies have shown that most women who are seeking fertility assistance at assisted reproductive technology clinics and attending general practice believe that women should receive fertility-awareness education when they first report trouble conceiving to their GP. However, the barriers and enablers of this education in general practice have not previously been explored or described. We therefore seek your assistance to gather this data which will be used to inform a new model of care to improve fertility-awareness of sub-fertile women in general practice. You have received this invitation because your contact details were obtained from the General Practice Victoria (GPV) website, you have responded to an advertisement from your professional network or you have consented to your name being on a data base at the Department of General Practice, Monash University.

Eligibility

General practitioners and practice nurses working in three different locations within Victoria; Bayside General Practice Network, Loddon-Mallee-Murray Medicare Local, and Inner East Melbourne Medicare Local.

Aim

The aim of the study is to gather data about the barriers and enablers of fertility-awareness education for sub-fertile women in general practice.

Possible benefits

There are no likely benefits to you directly for your participation in this study. However, it may lead to the development of an intervention that improves the chance of natural conception in sub-fertile women.

Your consent

Participation in this study is entirely voluntary and you are under no obligation to participate. Withdrawal can occur at any time up until the focus group or telephone interview is held.

Your participation

Your participation involves attending a focus group (around 90 minutes in duration) if you are a practice nurse or a telephone interview (around 30 minutes in duration) if you are general practitioner. A set of questions will explore the barriers and enablers of fertility-awareness education for sub-fertile women in general practice.

Inclusion/exclusion criteria

General practitioners and practice nurses working in general practice in Bayside General Practice Network, Loddon-Mallee-Murray Medicare Local, and Inner East Melbourne Medicare Local are invited to participate in this study.

Inconvenience, discomfort or possible harm

There are no expected risks such as increased stress or inconvenience or discomfort beyond that experienced in everyday life from your participation in this study. However, the research team is available should you wish to discuss any concerns.

Payment

You will be reimbursed for your time with a \$75.00 Coles/Myer voucher.

Privacy, confidentiality and disclosure of information

Any information obtained in a focus group of telephone interview that can identify you will remain confidential and will only be used for the purpose of the study. Information will only be disclosed with your permission, except if required by law. Please note that members of the research team are mandated by law to report certain behaviour. While it is not possible to make an absolute guarantee of confidentiality/anonymity, all reasonable steps will be taken to do so.

Storage of data



All data will be stored according to Monash University regulations. This means that it will be kept in a locked cupboard for 5 years on Monash University premises. Electronic data will be secured by an access code. Only the researchers will have access to the data.

Use of the data for other purposes

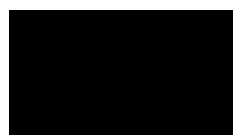
The results of this study may be submitted for publication as a journal article and/or presented at medical, nursing or scientific conferences. Most data will be reported in the form of a thematic analysis. Individual quotations will be assigned to a participant number only.

Results of research

If you would like to be informed of the study's findings, please contact Kerry Hampton at kerry.hampton@monash.edu. It is anticipated that the findings will be available from July 2012.

If you would like to contact the researchers about any aspect of this study, please contact the Chief Investigator:	If you have any complaints about any aspects of this research < CF11/2246 - 2011001268> or any questions about your rights as a research participant, please contact:
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Thank you for your time and participation.



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Consent Form

Exploring the barriers and enablers to fertility-awareness for sub-fertile women in general practice - CF11/2246 - 2011001268

NOTE: This consent form will remain with the Monash University researcher for their records

I agree to take part in the Monash University research project specified above. I have had the project explained to me, and I have read the Explanatory Statement, which I keep for my records. I understand that agreeing to take part means that:

I agree to be interviewed by the researcher Yes No

I agree to allow the interview to be audio-taped. Yes No

I understand that my participation is voluntary, that I can choose not to participate in this project, and that I can withdraw at any stage up until the focus group/telephone interview is being held without being penalised or disadvantaged in any way.

I understand that any data that the researcher extracts from the focus group/telephone interview for use in reports or published findings will not, under any circumstances, contain names or identifying characteristics.

I understand that any information I provide is confidential, and that no information that could lead to the identification of any individual will be disclosed in any reports on the project, or to any other party.

I understand that data from the focus group/telephone interview transcript/audio-tape will be kept in a secure storage and accessible to the research team. I also understand that the data will be destroyed after a 5 year period unless I consent to it being used in future research.

Participant's name

Signature

Date

Appendix 4: Interview and Focus Group Questions

Table 4.23 Question constructs based Michie et al.'s (2005) theoretical behaviour change framework

Domains	Constructs	Topics Related to Constructs
1. Knowledge	Knowledge about condition/scientific rationale Schemas + mindset + illness presentation Procedural knowledge	What do they know about FA methods? Do they think that they can provide FA education for women who are having trouble conceiving?
2. Skills	Competence/ability/skill assessment Practice/skills development Interpersonal skills Coping strategies	How do they describe their competence/skill level to provide FA education? Is FA education within their scope of practice? Have they attempted to improve their knowledge of FA methods?
3. Social/professional role and identity (Self-standards)	Identity Professional identity/boundaries/roles Group/social identity Social group norms Alienation/organisational commitment	Do they think FA education should be provided in general practice for women having trouble conceiving? Which practitioner group (GP, PN, women's health nurse) do they think should provide FA education and why? Do they think FA education is compatible or in conflict with their professional practice? Does FA education offer an opportunity to provide other professional services for women having trouble conceiving?
4. Beliefs about capabilities (Self-efficacy)	Self-efficacy Control - of behaviour and material and social environment Perceived competence Self-confidence/professional confidence Empowerment Self-esteem Perceived behavioural control Optimism/pessimism	How difficult or easy do they think it is to provide FA education? What problems have they encountered? What would help to overcome them? How confident are they that they can provide FA education despite the difficulties? How capable are they of maintaining their practice in FA education? How well equipped and comfortable do they feel to provide FA education?

<p>5. Beliefs about consequences (Anticipated outcomes/attitudes)</p>	<p>Outcome expectancy Anticipated regret Appraisal/evaluation/review Consequences Attitudes Contingencies Reinforcement/ punishment/regret Incentives/rewards Beliefs Unrealistic optimism Salient events/sensitisation/critical incidents Characteristics of outcome expectancies-physical, social, emotional Sanctions/rewards, proximal/distal, Valued/not valued, probable/improbable, salient/not salient, perceived risk/threat</p>	<p>What are the expected outcomes for women who receive FA education? What are the expected outcomes for clinicians who provide FA education? What do they think will be the consequences when FA education is not provided? What are the costs of providing FA education? Do the benefits of FA education outweigh the costs of providing the education? Does the evidence suggest that providing FA education is a good thing?</p>
<p>6. Motivation and goals (Intention)</p>	<p>Intention; stability/certainty Goals; autonomous, controlled Goal target/setting Goal priority Intrinsic motivation Commitment Transtheoretical model and stages of change</p>	<p>How strongly do they feel about providing FA education? Are there any incentives to provide FA education? Are there other things they want to do that might interfere with providing FA education?</p>
<p>7. Memory, attention and decision processes</p>	<p>Memory Attention Attention control Decision making</p>	<p>Do they usually provide FA education? Do they remember to provide or recommend FA education? What are their reasons for not providing FA education?</p>
<p>8. Environmental context and resources (Environmental constraints)</p>	<p>Resources/material resources availability and management Environmental stressors Person x environment interaction Knowledge of task environment</p>	<p>Are the necessary educational resources available to provide FA education? To what extent do physical and environmental factors facilitate or hinder FA education? Are there any competing time or task constraints?</p>
<p>9. Social influences (Norms)</p>	<p>Social/group norms; organisational development; leadership; team working; group conformity; organisational climate/culture; social pressure; power/hierarchy; professional boundaries/roles; management commitment; supervision; intergroup conflict; champions; social comparisons; identity - group/social, organisational commitment/alienation; conflict -</p>	<p>To what extent do social influences (for example, from health service managers, women and practitioners) facilitate or hinder the provision of FA education?</p>

	competing demands, conflicting roles; social support - personal, professional, organisational; social group norms – subjective, descriptive; learning and modelling	
10. Emotion	Stress; fear; burn-out; cognitive overload; tiredness; threat; positive/negative affect; anxiety/depression	To what extent do emotional factors (for example, fear, overload or anxiety) facilitate or hinder their ability to provide FA education?
11. Behavioural regulation	Routine/automatic/habit Breaking habits Direct experience/past habit Representation of tasks Stages of change model	Are any procedures or ways of working that would better enable the provision of FA education in general practice? What preparatory steps are needed to be able to provide FA education in general practice?
12. Nature of the behaviours	Routine/automatic/habit Breaking habit Direct experience/past behaviour Representation of tasks Stages of change model	What systems for maintaining long term change need to be put in place to ensure the delivery of FA education for sub-fertile women in the general practice setting?

Schedule of questions of the individual interviews and focus group and corresponding theoretical domains

Introductory question: Different people have different interpretations of the term ‘fertility-awareness’ (FA). Can you tell me how you understand this term? Then I will explain the meaning for the purposes of the interview questions.

Starter question: What is your overall impression of the availability of FA education in general practice for women who present with trouble conceiving?

Domain 7: Memory, attention and decision processes

What circumstances would prompt you to offer FA education to women who are having trouble conceiving?

Prompts

What about medical conditions, chronic diseases, overweight, life circumstances, geographic circumstances, financial situations, religious or cultural beliefs, male sub-fertility.

Domain 5: Beliefs about consequences (Anticipated outcomes/attitudes)

What do you consider the benefits of FA education for women who are having trouble conceiving, and what do you consider the consequences when it is not provided?

Domain 8: Environmental context and resources (Environmental constraints)

What factors in the general practice setting do you consider make it easier or difficult to provide FA education for women?

Domain 3: Social/professional role and identity (Self-standards)

Nurses are increasingly being employed in general practice and the roles of General Practitioners (GPs) and Practice Nurses (PNs) are changing. How do you envisage that GPs and PNs could work together to best provide FA education for women who are having trouble conceiving? What factors would make a team-based approach difficult and what factors would make it easier?

Domain 4: Beliefs about capabilities (Self-efficacy)

Do you think you can provide this education? What factors reduce your confidence and what factors would help improve it?

Domain 2: Skills

What particular skills do you think GPs/NPs should have who provide FA education for women who are having trouble conceiving? What are the difficulties in providing this education and is there anything that would make it easier?

Domain 6: Motivation and goals (Intention)

What do you consider are the main motivators among GPs/NPs for providing FA education for women having trouble conceiving are?

Domain 9: Social influences (Norms)

To what extent do you consider culture of practice in general practice facilitate or hinder practice in preventive health care. What level of interest do you think women who are having trouble conceiving have in FA?

Domain10: Emotion

To what extent do you consider emotions of any kind among GPs/PNs facilitate or hinder the provision of FA education for women who are having trouble conceiving? How strongly do you feel about FA education for women who are having trouble conceiving?

Domain 1: Knowledge

What specific knowledge on the topic of FA do you consider GPs/PNs should have who provide this education for women who are having trouble conceiving?

Domain11: Behavioural regulation

Are there any procedures, preparatory step or routines that could be put in place in general practice to better facilitate FA education for women who are having trouble conceiving?

Domain12: Nature of the behaviours

What systems do you consider are needed in general practice for maintaining the delivery of FA education for women?

Appendix 5: List of Publications

Refereed Articles

Hampton, K., Mazza, D., & Newton, JM. (2012). Fertility-awareness knowledge attitudes and practices of women seeking fertility assistance. *Journal of Advanced Nursing*, Vol. 69, Issue 5, 2012, pp. 1076-1084.

Impact Factor: 1.540; Ranking: 9/85 Nursing (Social Science), 10/88 Nursing (Science), 10/89 Nursing.

Hampton, K., & Mazza, D. (2009). Should spontaneous or timed intercourse guide couples trying to conceive? *Human Reproduction*, Vol. 24, Issue 12, pp. 3236-32367.

Impact Factor: 3.857; Ranking: 3/26 Reproductive Biology, 4/70 Obstetrics and Gynaecology.

Non-Refereed Articles

Hampton, K., Mazza, D., & Newton, JM. (2009). Fertility-awareness knowledge, attitudes and practices of women attending general practice. *Australian Nursing Journal*, Vol. 20, No. 6, 2012, p. 30.

Hampton, K., Mazza, D., & Newton, JM. (2012). Fertility-awareness knowledge, attitudes and practices of infertile women. *Australia Midwifery News*, Vol. 12, Issue 3, p. 15.

Hampton, K., Mazza, D., Newton, JM., & Parker, R. (2012). Fertility-awareness education for sub-fertile couples in the general practice setting. *Primary Times*, Vol. 11, Issue 4, p. 33.

Hampton, K., Mazza, D., Newton, JM., & Parker, R. (2011). Improving fertility-awareness education. *Australian Nursing Journal*, Vol. 19, No. 6, pp. 38-39.

Hampton, K., Mazza, D., Newton, JM., & Parker, R. (2011). Improving the fertility-awareness of women through primary health care. *Nursing Review*, Issue 6, p. 3.

Hampton, K. (2008). Assisted Reproductive Technology Services, PHCRIS (Primary Health Care Research & Information Service), *Infonet*, Vol. 12, Issue 7, p. 11.

Hampton, K. (2008). Fertility-awareness in women of reproductive age. *Connections*, Royal College of Nursing, *Australia Newsletter*, Vol. 1, Issue 11, p. 39.

ORIGINAL RESEARCH

Fertility-awareness knowledge, attitudes, and practices of women seeking fertility assistance

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Abstract

Aims. To report a descriptive study of fertility-awareness knowledge, attitudes, and practice of infertile women seeking fertility assistance.

Background. Previous research has suggested that poor fertility-awareness may be a contributing cause of infertility among women seeking fertility assistance at assisted reproductive technology clinics. The actual practices and attitudes towards fertility-awareness in this particular group of women are unknown.

Design. A cross-sectional questionnaire-based survey.

Methods. The study was conducted over 6 months, from 2007–2008, of women on admission to two assisted reproductive technology clinics in a major city in Australia.

Results. Two hundred and four of 282 distributed questionnaires were completed (response rate = 72.3%). Eighty-three per cent had attempted conception for 1 year or more, 86.8% actively tried to improve their fertility-awareness from one or more sources of the information, 68.2% believed they had timed intercourse mainly within the fertile window of the menstrual cycle in their attempts at conception, but only 12.7% could accurately identify this window. Ninety-four per cent believe that a woman should receive fertility-awareness education when she first reports trouble conceiving to her doctor.

Conclusions. Most women seeking assistance at assisted reproductive technology clinics attempt timed intercourse within the fertile window of the menstrual cycle. However, few accurately identify this window, suggesting that poor fertility-awareness may be a contributing cause of infertility.

Keywords: fertility-awareness, infertility, midwifery, natural family planning, nursing, primary health care, sub-fertility

Introduction

Infertility is an important health issue worldwide affecting an estimated 9% of couples (Boivin *et al.* 2009). The current trend in increased use of assisted reproductive technology (ART) is considered unsustainable leading to political decisions in some countries to limiting funding and therefore accessibility to treatment (Anderson *et al.* 2010). The extent to which infertility could be prevented in primary health care (PHC) by addressing modifiable lifestyle factors is unknown, but thought to be substantial (Macaluso *et al.* 2010).

The Australian Government is currently transforming Australia's healthcare system to emphasise PHC for its future success and sustainability in the long-term (Australian Government Department of Health and Aging 2010). There is strong evidence that a strengthened PHC system is associated with better population health, reduced healthcare costs and greater efficiency in healthcare systems (Starfield 2010).

Nurses and midwives are considered integral to developing and strengthening PHC systems (World Health Organization 1996, 2010). In Australia, the general practice nurse has been identified as a key stakeholder and provider of PHC services (Australian Government Department of Health and Aging 2010). Several government initiatives aim to support and extend the role of the practice nurse (Parker *et al.* 2010). Around 56.9% of general practices in Australia currently employ one or more practice nurses (Australian General Practice Network 2009). Peak nursing and medical organizations including the Royal College of Nursing, Australia (RCNA), Royal Australian College of General Practitioners (RACGP) and Australian Medical Association (AMA) all endorse the expanding role of the practice nurse (Phillips *et al.* 2008).

Much attention is being given to develop the role of the practice nurse to respond to identified needs of specific populations. Practice nurses in Australia are increasing their roles in chronic disease management, health promotion and preventive health activities (Parker *et al.* 2010). A science of self-care is considered foundational to nursing science. Within the concept of Orem's self-care framework, an important goal of nursing is to promote self-care agency through the acquisition of the necessary knowledge and skills that increase capacity for self-care and care of others (Denyes *et al.* 2001). This goal is congruent with the aims and philosophy PHC (Australian Government Department of Health and Aging 2010).

This article reports a descriptive study which was conducted to measure the fertility-awareness knowledge, attitudes, and practices of women having trouble conceiving.

The aim was to determine if these women have sufficient fertility-awareness (i.e. self-reliance) to optimize the chance of natural conception. Sub-optimal fertility-awareness in women having trouble conceiving could be ameliorated with an education-based intervention by practice nurses in PHC.

Background

Infertility is generally defined as when a couple fails to conceive after having regular unprotected intercourse for 12 or more months (Quinn 2005). The utility of this definition is to indicate the earliest time at which fertility investigations become appropriate to exclude the need for treatment, it does not necessarily indicate sterility (Blake *et al.* 1997).

Around 9% of couples fail to conceive within 12 months of trying (Boivin *et al.* 2009, Herbert *et al.* 2009) and increasingly these couples are being referred to ART clinics for fertility assistance. Between 2005–2009 ART treatment cycles increased in Australia by 48%, resulting in one in every 35 (3.2%) babies being born from ART (Wang *et al.* 2011). In some Nordic countries this figure is higher. Denmark is the only country with a national reporting system of all ART treatments; and there around 1 in 16 (6.2%) babies is born from ART. The trend in increased use of ART is expected to continue to rise (Andersen & Erb 2005).

ART-conceived pregnancies when compared with naturally conceived pregnancies are associated with higher perinatal morbidity and mortality for both mothers and babies (Hansen *et al.* 2005, Chambers *et al.* 2007, Fisher *et al.* 2008). Assisted reproduction is a known risk factor for postnatal mood disturbance and earlier parenting difficulties (Fisher & Hammarberg 2005). The cost per live birth of ART-conceived babies is significantly higher (Chambers *et al.* 2006) and so are the healthcare costs of these children up to 7 years old (Koivurova *et al.* 2007).

Not all couples who are having trouble conceiving can access ART or wish to utilize ART for religious, personal or financial reasons (Eshre Capri Workshop Group 2004). ART treatment is both expensive and stressful for couples and concerns are increasingly being raised about its possible over use and unnecessary or premature use in certain situations (Gnoth *et al.* 2002, Eijkemans *et al.* 2008, Haywood 2009). In addition, although the success of ART treatment has improved over the past three decades, it still remains relatively low. Recent Australian data have shown that only 17.2% of *in vitro* fertilization (IVF) cycles (the most common form of ART treatment) resulted in the birth of a live-born baby (Wang *et al.* 2011).

To date, little research has focused on the prevention of infertility. One area of contention in the literature is the role

of fertility-awareness in the PHC of women having trouble conceiving. Natural family planners advocate fertility-awareness to ensure accurately timed intercourse within the fertile window of the menstrual cycle. Studies have shown that this may reduce time-to-pregnancy (Wilcox *et al.* 1995) and help avoid unnecessary ART treatment (Frank-Herrmann *et al.* 2005, Scarpa *et al.* 2007). In contrast, the National Institute for Clinical Excellence (2004) states that '...people who are concerned about their fertility should be informed that sexual intercourse every 2–3 days optimizes the chance of pregnancy. Timing intercourse to coincide with ovulation causes stress and is not recommended' (National Institute for Clinical Excellence 2004, p. 8). This recommendation is based on only one study that has been critiqued as poor quality evidence (Hampton & Mazza 2009).

There are three methods of fertility-awareness; rhythm, temperature and mucus. The rhythm method is a poor method of fertility-awareness as it can only estimate the timing of the fertile window of the menstrual cycle, whereas the temperature and mucus methods are highly accurate (Wilcox *et al.* 1995, Stanford *et al.* 2002, Scarpa *et al.* 2007). The temperature method retrospectively indicates the timing of ovulation by a basal body temperature (BBT) rise of 0–0.5°C that remains elevated until next menstruation (Colombo & Masarotto 2000). The mucus method prospectively indicates the timing of the fertile window by the presence of fertile-type mucus at the vulva for an average 6 days ending on the day of ovulation (Fehring 2002).

Pregnancy is only a possibility with intercourse within the fertile window of the menstrual cycle (Wilcox *et al.* 1995). Despite this fact, only one study has previously investigated the fertility-awareness of infertile women seeking fertility assistance finding that 76% could not accurately identify the fertile window (Blake *et al.* 1997). The actual practices and attitudes towards fertility-awareness in this particular group of women are unknown.

The study

Aims

The aim of this study was to determine the fertility-awareness knowledge, attitudes, and practices of infertile women seeking fertility assistance.

Design

A cross-sectional survey was carried out using a self-administered questionnaire of infertile women on admission to two different ART clinics in a major city in Australia.

Sample

The two different ART clinics (one in inner and one in outer metropolitan) in a major city in Australia were chosen to represent women from diverse socioeconomic backgrounds. The outer metropolitan ART clinic compared with the inner metropolitan clinic was located in a socioeconomically disadvantaged area in terms of household income, education, occupation, and the proportion of non-English speaking background people (Australia Bureau of Statistics 2006, 2008).

All women on admission to the ART clinics were invited to complete an anonymous questionnaire (either onsite or at home and returned in a reply-paid envelope) by either the fertility nurse or the researcher between December 2007–July 2008. Exclusion criteria were: (i) no menstruation in the previous 6 months; and (ii) women who could not read English.

Based on Blake *et al.*'s (1997) rate of high fertility-awareness (26%) among infertile women ($n = 80$), we determined that a minimum overall sample size of 172 was required to obtain a 95% confidence level that less than 50% of women seeking fertility assistance at ART clinics could accurately identify the fertile window of the menstrual cycle (De Vaus 2002).

Data collection

With permission we refined the fertility-awareness questionnaire developed by Blake *et al.* (1997). Modifications to the original questionnaire were made to determine detailed knowledge and practice of the rhythm, temperature, and mucus methods. These additional questions were informed by the research evidence in this field (Colombo & Masarotto 2000, Fehring 2002, Gnoth *et al.* 2002, Frank-Herrmann *et al.* 2005). The questionnaire was also extended to determine attitudes towards fertility-awareness, use of the fertile period, and the socio-demographic characteristics of the study sample. Our modified questionnaire was then piloted by six women ($n = 6$) in a Melbourne women's health service; no changes were made as a result of the pilot study.

The 17-item questionnaire was divided into three sections. The first section gathered the socio-demographic characteristics of the study sample including age group, highest educational level attained, years tried to conceive, number of general practitioner, and fertility specialist appointments attended regarding trouble conceiving, infertility diagnoses, and average length of the menstrual cycle. The second section determined knowledge and practice of the three fertility-awareness methods and use of

the fertile window in their attempts at natural conception. The third section measured attitudes towards fertility-awareness by gathering information about attempts at improving their knowledge. Two 5-point Likert Scale statements (from strongly agree to strongly disagree) were used to measure their perception of the importance of the knowledge. The questionnaire and fertility-awareness scoring sheet are available on request.

Ethical considerations

Research Ethics Committee approval was obtained from the university ethics committee and from the participating hospitals. Informed consent was implied through the women’s completion of the questionnaire.

Data analysis

All questionnaires were graded independently by two clinicians (a nurse and a general practitioner) for fertility-awareness using a predetermined assessment sheet. Where a discrepancy occurred, resolution was achieved through review and discussion between both clinicians. Table 1 shows the methods for grading fertility-awareness into one of four categories (none, poor, moderate or high). Only those graded with high fertility-awareness were considered to have sufficient knowledge to accurately identify the fertile window of the menstrual cycle. Data were analysed in Excel to determine the socio-demographic characteristics of the study sample, attitudes towards fertility-awareness and use of the fertile window. These attributes are expressed in percentages. A regression analysis was

Table 1 Methods for grading fertility-awareness into 1 of 4 categories.

Fertility-awareness categories	Methods
None	Answered: ‘Never’ aware of the fertile days of the menstrual cycle
Poor	Awareness of the fertile days was based on the rhythm method, perceived ovulation pain or poor knowledge of the mucus method
Moderate	Demonstrated accurate knowledge of the mucus method, but had not documented a minimum of three menstrual cycles with this method
High	Demonstrated accurate knowledge of either the mucus or temperature method and had documented a minimum of three menstrual cycles with either method or both methods

undertaken in *SPSS* (Statistical Package for Social Science Inc 1995) to determine the factors associated with high fertility-awareness; a factor with a *p* value of 0.05 or less was considered to be statistically significant (Pallant 2007).

Reliability

The questionnaire was tested for reliability with Kappa Measure of Agreement in *SPSS* (Statistical Package for Social Science Inc (1995)) to determine inter-rater agreement between the two clinicians who assessed each questionnaire for fertility-awareness, with a resultant value of 0.82. A Kappa value of 0.5 represents moderate agreement, above 0.7 represents good agreement and above 0.8 represents very good agreement (Pallant 2007).

Results

Two hundred and four of 282 distributed questionnaires were completed providing a total response rate of 72.2%; 105 (51.5%) were completed in the inner metropolitan clinic and 99 (48.5%) were completed in the outer metropolitan clinic.

Demographic characteristics

Table 2 presents the socio-demographic characteristics and diagnosed causes of infertility in the study sample; 89 (43.6%) were 36 years or more, 124 (60.8%) had completed a university degree and 170 (83.3%) had attempted conception for 12 months or more. Two hundred (98.1%) had attended at least one general practitioner appointment about their fertility problem, 125 (61.8%) had attended at last two or more fertility specialist appointments and 161 (78.9%) had been given a diagnosis for their infertility.

Fertility-awareness knowledge and practice

One hundred and seventy-seven (88.1%) believed they were either often aware or sometimes aware of the fertile days of the menstrual cycle. Table 3 summarizes knowledge and practice of the three fertility-awareness methods showing that all were poorly understood and poorly applied. Twenty-six (12.7%) combined accurate knowledge of either the temperature or mucus method with documentation of a minimum of three menstrual cycles and were therefore graded as having high fertility-awareness; most were graded as having either no fertility-awareness (11.8%) or poor fertility-awareness (52.5%) (Table 4). Inter-rater agreement was high with Kappa = 0.82.

Table 2 Socio-demographic characteristics and diagnosed causes of infertility in the study sample.

	N = 204	%	Number missing
Site			
Inner metropolitan ART service	105	51.5	
Outer metropolitan ART service	99	48.5	
Age			
25 years or less	4	2	
26–35 years	111	54.4	
36 years or older	89	43.6	1
Highest level of education attained			
Completed primary school	2	1	
Completed secondary school	55	27	
Completed a trade course	21	10.3	
Completed a university degree	124	60.8	2
Average length of menstrual cycle			
26 days or less	26	12.9	
27–35 days	148	73.3	
>35 days	12	5.9	
Irregular			
Years tried to conceive naturally	16	7.9	2
<1 year	28	13.7	
1–2 years	100	49	
3 years or more	70	34.3	6
General practitioner consultations attended			
1 only	99	48.5	
2–3 times	76	37.3	
4 times	25	12.3	4
Fertility specialist consultations attended			
1 only	77	37.7	
2–3 times	84	41.2	
4 times	41	20.6	2
Infertility diagnoses			
Yes	161	78.9	
No	38	18.6	5
Diagnosed causes of infertility (respondents could tick one or more diagnosed causes)			
Combined male and female factor problems	141 (161)	87.5	
Male Factor	59 (161)	36.6	
Unexplained	38 (161)	23.6	
Blocked fallopian tubes	29 (161)	18.0	
Poly cystic ovaries (PCOS)	28 (161)	17.3	
Endometriosis	29 (161)	18	
Other (poor organ development, no fallopian tubes, ovarian malignancy, abnormal ovarian reserve, previous ectopic pregnancy, mumps, vasectomy, lupus erythematosus, tubal ligation, and carriers of genetic disorders)	16 (161)	0.09	

Table 3 Knowledge and practice of fertility-awareness methods in infertile women.

	N = 204	%	Missing data
Rhythm-based approach			
Perceived awareness of the fertile days either often or sometimes	177	88.1	2
Mucus method			
Often aware of mucus changes	58	28.4	23
Knew the mucus type that indicates the fertile time	48	23.5	
Could describe the mucus change that indicates the beginning of the fertile time	44	21.5	
Could describe the mucus change that indicates the end of the fertile time	26	12.7	
Had documented a minimum of three menstrual cycles with the mucus method	26	12.7	
Temperature method			
Ever used the temperature method	72	35.2	29
Knew the temperature change that indicates the occurrence of ovulation	11	5.3	7
Knew the fertile time of the menstrual cycle based on the temperature change	14	6.8	2
Had documented a minimum of three menstrual cycles with the temperature method	50	24.5	

Use of the fertile period

One hundred and twenty-two women (68.2%) believed they had timed intercourse mainly within the fertile window of the menstrual cycle in their attempts at conception.

Attitudes to fertility-awareness

One hundred and ninety-one (94.5%) either agreed or strongly agreed that a woman should receive fertility-awareness education when she first reports trouble conceiving to her doctor and 150 (75.4%) either agreed or strongly agreed that timing intercourse within the fertile window of

Table 4 Number and percentages of infertile women graded into 1 of 4 fertility-awareness categories.

Fertility-awareness categories	N = 204	%
None	22	11.8
Poor	106	52.5
Moderate	49	24
High	26	12.7

the menstrual cycle can help some infertile couples to conceive naturally. One hundred and fifty-eight (86.8%) actively tried to improve their fertility-awareness using information from one or more sources. Table 5 lists the sources and shows the number of different sources individual women had accessed. A regression analysis shows that those women with high fertility awareness had accessed several fertility-awareness information sources ($P = 0.001$) (95% CI: 0.177–0.714). No association was found with the location of the ART clinic (inner or an outer metropolitan Melbourne), age, years tried to conceive, number of general practitioner or fertility specialist appointments attended, highest educational level attained, diagnosed cause of infertility or any one source of information.

Discussion

In this study we measured attitudes towards fertility-awareness in women having trouble conceiving, reported on their attempts at improving their knowledge and compared perceived fertility-awareness against actual fertility awareness in these women. Not only did most women have poor fertility awareness, most also significantly over estimated the little knowledge they had. Both of these situations can have implications for women's capacity for family planning self-care (Frank-Herrmann *et al.* 2005).

Table 5 Fertility-awareness information sources and the number of sources individual women accessed.

	N = 204	%	Number missing
Actively tried to improve their knowledge			
Yes	158	86.8	
No	24	13.2	22
Sources of the information			
Internet	101	49.5	
Book	89	43.6	
General practitioner	63	30.0	
Friend	54	26.6	
IVF clinic	37	18.1	
Other	6	2.9	
Natural fertility teacher	10	4.9	
Number of information sources individual women accessed			
1	48	23.5	
2	45	22.1	
3	35	17.2	
4 or more	29	15.2	

Women having trouble conceiving by and large had positive attitudes towards fertility-awareness with most wanting to know and understand this aspect of their reproductive capacity and be sure of timing intercourse correctly within the fertile window. Why only 31.9% sought the information from their doctor and most looked to other sources (particularly the internet and books) is unknown. However, current guideline recommendations combined with poor knowledge of the temperature and mucus methods among general practitioners (Stanford *et al.* 1999) may in part explain this. The role of the practice nurse in providing this education has not previously been explored. However, fertility-awareness education fits well with nursing practice in general because of its holistic and educational focus in promoting patient health (Fehring 2004). Promoting capacity for self-care agency is a critical element of Orem's theory of self-care (Denyes *et al.* 2001).

The fact that the greater majority (86.8%) actively tried to improve their fertility awareness from one or more sources of the information, but only 12.7% could accurately identify the fertile window, raises questions about the quality and accuracy of the information sources women are accessing and also the fact that the educational needs of women to integrate fertility-awareness information into knowledge and practice is not being addressed. In contrast, 80% of women who were having trouble conceiving and who had attended a trained teacher of fertility-awareness methods could identify the fertile window of the menstrual cycle (Blake *et al.* 1997). Education of doctors (particularly general practitioners) in fertility-awareness methods and greater utilization of trained teachers by doctors and fertility specialists for women having trouble conceiving may ameliorate this discrepancy.

Although intercourse 2–3 times per week (as the current guideline recommends) will probably result in one to two acts of intercourse occurring within the fertile window, this regimen may be difficult for some couples to maintain and unsatisfactory for others for a number of reasons (Scarpa *et al.* 2007). In the ideal health system which promotes health literacy, self-care and prevention in PHC, all couples having trouble conceiving who wish to time intercourse within the fertile window should be supported to attain high fertility-awareness and only be referred on to ART clinics after applying this approach in a minimum of six menstrual cycles, as this is necessary to optimize the chance of natural conception (Wilcox *et al.* 1995, Colombo & Masarotto 2000, Stanford *et al.* 2002).

We confirm that most women seeking fertility assistance cannot accurately identify the fertile window of the menstrual cycle (Blake *et al.* 1997). We also confirm that there

is no association between high fertility-awareness and socio-economic status (Sievert & Dubois 2005). Fewer women in our study compared with Blake *et al.*'s (1997) study were diagnosed as having unexplained infertility (23.6% vs. 57%) and significantly more as having a male factor fertility problem (36.6% vs. 8%). Another notable difference was that 68.2% attempted timed intercourse in our study compared with only 15% in Blake *et al.*'s (1997) study. The demographic characteristics of our study sample are similar to those reported in previous studies of infertile women seeking fertility assistance in Australia with a statistically significant proportion (43.6%) being 36 years or more and most being well educated (60.8% had a tertiary degree) (Hammarberg & Clark 2005).

Addressing modifiable lifestyle risk factors such as the poor fertility-awareness of sub-fertile women in PHC is one way to optimize the chance of natural conception. It may reduce the risk of unnecessary ART treatment and the increased health risks for mothers and babies associated with its use (Mourad *et al.* 2008). It is also one way of providing a safe, low cost, self-help intervention for optimizing natural conception with the added benefits of it being compatible with those who choose not to utilize ART treatment or cannot access ART treatment (Stanford *et al.* 1999, Eshre Capri Workshop Group 2004, Zinaman 2006).

Implications for nursing practice

In alignment with the underlying philosophy of Orem's self-care theory, greater emphasis should be placed on educating women about fertility awareness when they first report trouble conceiving to their doctor. This may enable this group of women greater self-care agency in managing their sub-fertility. This may be a potential role for practice nurses to embrace in PHC services, as the Australian government has identified practice nurses as future key providers of preventive health activities. However, the educational preparation of these nurses to provide fertility-awareness education is unknown, but thought to be poor. Determining their educational requirements and designing a programme of education is the next step to developing a new model of care with the aim of reducing infertility in PHC.

Limitations

Our findings are limited by the quantitative nature of our data and the fact that we limited our sample to two metropolitan ART clinics in a major city in Australia. We were also unable to measure the clinical significance of sub-optimal fertility awareness in these women. Additional research

is necessary in a well designed clinical trial to measure the impact of high fertility-awareness on time-to-pregnancy and therefore risk of infertility and unnecessary ART treatment.

Conclusions

Most women seeking assistance at ART clinics attempt timed intercourse within the fertile window of the menstrual cycle. However, few can accurately identify this window, suggesting that poor fertility-awareness may be a contributing cause of infertility. It would appear that a gap exists between what women desire in relation to fertility-awareness education; with the knowledge and understanding of those immediate health professionals with whom this group of women first approach. Additional research and development is required in the field of fertility-awareness education to enable practice nurses to provide appropriate care and support in assisting these women to achieve greater self-care agency.

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Conflict of interest

No conflict of interest has been declared by the authors.

Author contributions

All authors meet at least one of the following criteria (recommended by the ICMJE: http://www.icmje.org/ethical_1author.html) and have agreed on the final version:

- substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data;
- drafting the article or revising it critically for important intellectual content.

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Should spontaneous or timed intercourse guide couples trying to conceive?

Sir,

We read the letter published in your journal by Snick (2005) who cites the statement by the National Institute for Clinical Excellence (NICE, 2004) Guidelines that 'Timing intercourse to coincide with ovulation causes stress and is not recommended'. NICE also states that '... people who are concerned about their fertility should be informed that sexual intercourse every 2 to 3 days optimizes the chance of pregnancy'. We wish to make the following points.

First, the guideline recommendation not to time intercourse to coincide with ovulation is based on only one study (Kopitzke *et al.*, 1991) that reports the results of a mail survey (with a sample size of 26 women) measuring their perceived stress levels in relation to infertility routines, procedures, medications and events. In this study, no comparison was made between stress levels in women who timed intercourse in the fertile window and those continuing intercourse 2–3 times a week irrespective of the timing of the fertile window. We therefore believe that the NICE recommendation is not valid as it is based on poor quality data.

Secondly, we live in a time when medicine has moved beyond paternalism to respect the concept of the informed patient and this is especially important in reproductive health where knowledge of the menstrual cycle and fertility-awareness is essential to women's capacity for family planning and fertility self-care (Frank-Herrmann *et al.*, 2005; Bunting and Boivin, 2008). Women have a right to know and understand their fertile body.

The World Health Organization (WHO) identifies sexual and reproductive health as a human right and a priority that should be promoted through woman-centred delivery practices in comprehensive primary care services (World Health Organization, 2007). In keeping with this vision, health professionals should strive to educate women about their fertility and not keep them in the dark, particularly as many studies now show that pregnancy is only a possibility with intercourse in the fertile window of the menstrual cycle (Wilcox *et al.*, 1995; Gnoth *et al.*, 2003; Brosens *et al.*, 2004).

Women having trouble conceiving are aware of their limited fertility knowledge and the need to improve it (Dyer *et al.*, 2002). A large number of women use Google to find information on fertility-awareness methods (Snick, 2005). We believe that it would be better for women to receive the information from well-informed,

credible sources such as their health practitioners. In conclusion, we agree with Snick that further research is necessary and that properly designed trials testing the efficacy of education regarding fertility-awareness should be undertaken but believe that this is a separate issue to a woman's right to know and understand her fertile body.

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Appendix 6: Conference Presentations

Hampton K, Mazza D, Newton JM & Parker R. Informing the Development of a New Model of Care to Improve the Fertility-Awareness of Sub-Fertile Women in Primary Health Care. Fertility Society of Australasia, Sydney, (Oral presentation) 1-4 September 2013

Hampton K, Mazza D, Newton J & Parker R. Family Planning Knowledge and Practice Gaps in General Practice. Australian Practice Nurses Association 2013 National Conference, Movers and Shakers, Melbourne (Workshop presentation) 2-4 May 2013

Hampton K & Mazza D. Fertility-awareness knowledge, attitudes, and practices of women attending general practice. First National Sexual & Reproductive Health Conference, Melbourne (Oral presentation) 20-21 November 2012

Hampton K, Mazza D, Newton JM & Parker R. Informing the Development of a New Model of Care to Improve the Fertility-Awareness of Sub-Fertile Women in Primary Health Care. First National Sexual & Reproductive Health Conference, Melbourne (Poster) 20 -21 November 2012

Hampton K, Mazza D, Newton JM & Parker R. Informing the Development of a New Model of Care to Improve the Fertility-Awareness of Sub-Fertile Women in Primary Health Care. Australian Practice Nurses Association 2012 National Conference – Time to Shine, Melbourne Australia (Oral presentation) 3-5 April 2012

Hampton K & Mazza D. Fertility-awareness knowledge, attitudes, and practices of women attending general practice. Making Change Happen: Monash University Department of General Practice Research, Melbourne Australia (Oral presentation) 27 October 2011

Hampton K & Mazza D. Fertility-awareness knowledge, attitudes, and practices of women seeking fertility assistance. Making Change Happen: Monash University Department of General Practice Research, Melbourne Australia (Poster) 27 October 2011

Hampton K & Mazza D. Informing the Development of a New Model of Care to Improve the Delivery of Fertility-Awareness Education to Sub-Fertile Women in the General Practice Setting. RCNA Community and Primary Health Care Nursing Conference, Hobart, Australia (Poster) October 19-21 2011

Hampton K & Mazza D. Fertility-awareness knowledge, attitudes, and practices of women attending general practice. Australian Practice Nurses Association 2011 National Conference – Roadmap for the Future: Great Expectations, Sydney, Australia (Oral presentation) 7-9 April 2011

Hampton K & Mazza D. Fertility-awareness knowledge, attitudes, and practices of women seeking fertility assistance. Australian Practice Nurses Association National Conference – Roadmap for the Future: Great Expectations, Sydney, Australia (Poster) 7-9 April 2011

Hampton K & Mazza D. Fertility-awareness knowledge, attitudes, and practices of women seeking fertility assistance and attending general practice. 2011 Pfizer Endocrine Nurses National Conference, Melbourne, Australia (Oral Presentation) 20 February 2011

Hampton K & Mazza D. Fertility-awareness knowledge, attitudes, and practices of women seeking fertility assistance and attending general practice. 2010 Annual Meeting of Endocrine Nurses Society of Australia, Melbourne, (Oral presentation), 18 November 2010

Hampton K & Mazza D. Fertility-awareness knowledge, attitudes, and practices of women attending general practice. 2010 Community and Primary Health Care Nursing Conference, RCNA, Alice Springs, Australia (Oral presentation) 24-26 October 2010

Hampton K & Mazza D. Fertility-awareness knowledge, attitudes, and practices of women attending general practice. 2010 Primary Health Care Research Conference, Darwin, Australia (Oral presentation) 30 June -2 July 2010

Hampton K & Mazza D. Fertility-awareness knowledge, attitudes, and practices of women seeking fertility assistance. 6th Australian Women's Health Conference, Australian Women's Health Network (Poster) 18-21 May 2010

Hampton K & Mazza D. Fertility-awareness knowledge, attitudes, and practices of women seeking fertility assistance. 3rd Annual Victorian Primary Health Care Research, Evaluation and Development Conference, Monash University, Melbourne, Vic. (Oral presentation) 9 November 2009

Hampton K & Mazza D. Fertility-awareness knowledge, attitudes, and practices of women seeking fertility assistance. Fertility Society of Australasia Conference, Perth, Australia (Oral presentation) 21-23 October 2009

Hampton K & Mazza D. Fertility-awareness knowledge, attitudes, and practices of women seeking fertility assistance. 2009 General Practice and Primary Health Care Research Conference, Melbourne, Australia (Oral presentation) 15-17 July 2009

Hampton K & Mazza D. Fertility-awareness knowledge, attitudes, and practices of women seeking fertility assistance. 2nd Annual Victorian Primary Health Care Research, Evaluation and Development Conference, Monash University, Melbourne (Oral presentation) 7 November 2008

Hampton K & Mazza D. Fertility-awareness knowledge, attitudes, and practices of women seeking fertility assistance. WONCA/RACGP ASC 2008 Conference, Melbourne (Oral presentation) 2-5 October 2008

Hampton K & Mazza D. Fertility-awareness knowledge, attitudes, and practices of women seeking fertility assistance. 2008 Royal College of Nursing Australia Annual Conference, Perth, Australia (Poster) 25-27 September 2008

Hampton K & Mazza D. Fertility-awareness knowledge, attitudes, and practices of women seeking fertility assistance. 10th Congress of the European Society of Contraception, Prague, Czech Republic (Poster) 30 April -3 May 2008

Hampton K & Mazza D. Fertility-awareness knowledge, attitudes, and practices of women seeking fertility assistance. 8th Congress on Women's Mental Health, Melbourne, Australia (Poster) 17-20 March 2008