

**A qualitative study of healthcare workers’
and patients’ perspectives on changing the
model of care from outpatient to in-home
for the infusion of natalizumab**

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Abstract

This study is part of a larger project that examines the safety and clinical effectiveness, acceptability and cost effectiveness of flexible delivery of natalizumab by ambulatory care nurses for people with multiple sclerosis. Currently, people with multiple sclerosis receive natalizumab intravenous infusions through an outpatient intravenous therapy service. Using a hospital in the home model to offer people with multiple sclerosis natalizumab infusions in their own home could be an improved model of care for patients. However, no previous qualitative research has focused on healthcare workers' and patients' experiences of a change in the model of care from outpatients to the home for the infusion of natalizumab. This Masters by Research is by publication and includes two published studies as follows.

The first stage of this study aimed to understand the experiences of people with multiple sclerosis who received infusions of natalizumab at home instead of in hospital. Returning every four weeks to an outpatient department to complete an intravenous infusion can be taxing for patients with chronic disease. This exploratory-descriptive study incorporated face-to-face digital-recorded interviews with people with multiple sclerosis. Twelve people with multiple sclerosis (two males and 10 females) aged between 18 and 56 years participated in this study. A major theme that emerged from the findings was the importance of 'patient-centredness', or the positive contribution of having patients at the centre of care when delivering home infusions. This encompassed three subthemes: 'in the comfort of their own home', 'convenience for patients and their families' and 'saving time and money'. Patient-centred care was an important part of the model of care because it provided flexibility for the participants in managing their home and work-life commitments. Although home infusion therapy requires a team approach, this study found that delivering patient-centred home infusions provided significant satisfaction for people with multiple sclerosis.

The second stage of this study explored healthcare workers' experiences of delivering natalizumab infusions in a home environment. In this exploratory-descriptive inquiry, the researcher sought to gain an understanding of healthcare workers' perspectives on the patient-centred model of care of home infusions of natalizumab. There were 12 participants from two main groups of healthcare workers who participated in delivering natalizumab infusions during the six-month study period. Four participants were from a private provider of home nursing care and eight were from a tertiary hospital ambulatory

care day unit. Thematic analysis of the data identified three overarching themes: 'preparing for change', 'focussing on the patient', and 'professional support'.

Healthcare workers' practice experience is an important component of patient-centred care during the delivery of an infusion at a patient's home and flexible processes are required to deliver quality home care. Flexibility, communicating clearly and being willing to work in a team, especially between the hospital and the home nursing staff, were important factors in the safe delivery of infusions at home. Managing the logistics of delivering a flexible and safe home therapy service, though time consuming, was an important part of this patient-centred model of care.

Thesis declaration

I certify that this work contains no material which has been accepted for the award of any other degree or diploma in my name in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text. In addition, I certify that no part of this work will, in the future, be used in a submission in my name for any other degree or diploma in any university or other tertiary institution without the prior approval of the University of Adelaide and where applicable, any partner institution responsible for the joint award of this degree. I give permission for the digital version of my thesis to be made available on the web, via the University's digital research repository, the Library Search and also through web search engines, unless permission has been granted by the University to restrict access for a period of time.

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Mahasen Juaton

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Finally, I would like to thank the participants for sharing their lived experiences with me, knowing that such experiences can lead to knowledge acquisition for healthcare professionals and possibly delivery of natalizumab infusions in a home setting.

Abbreviations

CINAHL	Cumulative Index to Nursing and Allied Health
HITH	Hospital in the home
MS	Multiple sclerosis
OITS	Outpatient intravenous therapy service
PML	Progressive multifocal leukoencephalopathy
RRMS	Relapsing-remitting multiple sclerosis

Definitions

Home care service is used in this thesis to refer to infusion therapy that is provided in the home (Alexander et al. 2011).

Models of care ‘broadly defines the way health services are delivered’ (Agency for Clinical Innovation 2013, p. 3).

Multiple sclerosis is defined as ‘an autoimmune disease of the central nervous system that results in demyelination and axonal degeneration’ (Miller, Karpinski & Jezewski 2012, p. 39).

Outpatient intravenous therapy service is used to refer to infusion therapy that is provided without an overnight stay in a hospital (Alexander et al. 2011).

TYSABRI® (natalizumab) ‘is a prescription medicine used to treat adults with relapsing forms of multiple sclerosis to slow the worsening of symptoms common in people with multiple sclerosis and to decrease the number of flare-ups (relapses)’ (Biogen 2016).

Chapter One: Introduction

Introduction

For people with chronic disease, returning on a monthly basis to an outpatient department to complete an intravenous infusion can be very taxing. Over the last century, the healthcare system has experienced a major change in the location of delivery of infusion for people with chronic disease (Beijer et al. 2008). For instance, oncology patients are no longer required to be admitted to hospital for the infusion of chemotherapy drugs. They now have alternative infusion settings, either in a health service oncology clinic, outpatient intravenous therapy service, or a community setting. Chataway et al. (2006) noted that when considering how to improve the delivery of care there should be an emphasis on minimising or avoiding outpatient hospital care for people with chronic disease who receive intravenous therapy. These improvements aim to reduce the risk of hospital-acquired infections and increase the quality of life for people with chronic disease. Multiple sclerosis (MS) is one chronic disease that requires regular ongoing treatment. This requires access to health services for administration of the treatment. The regular travel and time commitment for hospital treatment may impact on the person's quality of life. People with MS can be treated in an outpatient intravenous therapy service (OITS), but the community/home environment may be a better option to fit in with their personal and work routines. This thesis by publication will explore this issue in more depth.

Multiple sclerosis

Multiple sclerosis (MS) was first described by clinicians at the end of the nineteenth century (Compston & Coles 2002). It is an inflammatory chronic disease that affects the central nervous system, which includes the optic nerves, spinal cord and brain, with an unknown cause. People with MS can present with a complex range of neurological symptoms. Some of the major indicators include, but are not limited to, fatigue, heat intolerance, walking difficulties, visual disorders, gastrointestinal disturbance and muscle weakness. People with MS may have a mix of symptoms that can negatively impact their quality of life (Koopman, Benbow & Vandervoort 2006; McCormack 2013; Levin 2007). Generally, this special condition or disease may cause impairment and disturbance in many areas of an individual's life including work, activities of daily living and family functions. Each and every day poses unique challenges, not only to the individual but also to their family members (Koopman, Benbow & Vandervoort 2006). Worldwide, around 2–2.5 million people have been diagnosed with MS and over 23,000 people in Australia, where about three quarters of these are female (Compston & Coles 2002; Kornek 2015; Multiple Sclerosis Society Australia 2012).

Multiple Sclerosis Society Australia (2012) noted that the majority of people with MS are between the ages of 15 to 50 years and symptoms are often first reported in young adults. The Multiple Sclerosis Society Australia (2012) and Levin (2007) highlighted four types of MS progression:

- relapsing-remitting multiple sclerosis
- primary-progressive multiple sclerosis
- secondary-progressive multiple sclerosis
- relapsing-progressive multiple sclerosis

Kornek (2015) and Runmarker and Andersen (1993) stated that most people with MS start out with relapsing-remitting multiple sclerosis (RRMS). This is characterised by attacks, when symptoms flare up, or exacerbations, called ‘relapses’, followed by a brief period of time when no symptoms are present, called ‘remission’ (Kornek 2015; Multiple Sclerosis Society Australia 2012). A relapse is defined as ‘a period of at least 24 hours in which new symptoms develop, or existing ones deteriorate’ (Noyes et al. 2011, p. 358). In this thesis, only RRMS will be discussed.

For many decades, there has been no cure for people diagnosed with MS. However, there are several medications known as disease-modifying therapies that are recommended to treat the disease process (Elovaara 2011; Gajofatto & Benedetti 2015; Goodin 2008; Kappos et al. 2004; Stuve 2009). Compston and Coles (2002) and Miller, Karpinski and Jezewski (2012) stated that, prior to the 1990s, there were no disease-modifying therapies to reduce the number and severity of relapses that occur with MS. Now, the US Food and Drug Administration, together with the European Medicines Agency, have approved 13 drugs for use as disease-modifying therapies in RRMS (Gajofatto & Benedetti 2015; Kornek 2015). The availability of these therapies offers the individual several years of controlling the disease and improving their quality of life. Gajofatto and Benedetti (2015, p. 545) emphasised that these therapies ‘modulate or suppress with different mechanisms the autoimmune process that underlies the disease’, thereby minimising the occurrence of relapse or preventing disease progression. Over the last few years, a wide variety of disease-modifying therapy agents have been developed for the treatment of people with MS, including natalizumab. Natalizumab is one of the first targeted disease-modifying therapies approved for the treatment of adults with RRMS (McCormack 2013; Nicholas et al. 2014; Stuve 2009).

Natalizumab therapy

Natalizumab is a disease-modifying therapy that either slows or stops the progression of disability, offering effective relief of both symptomatic and neurological disability activity. Worldwide, natalizumab is used as a first line of treatment for people with RRMS (Kamat et al. 2009; McCormack 2013; Nicholas et al. 2014; O'Connor & Kremenchutzky 2015; Stuve 2009; Totaro et al. 2014). It has a positive outcome not only in resolving the neurological symptoms but also improving the quality of life for many. However, natalizumab therapy recipients have the risk of developing progressive multifocal leukoencephalopathy (PML), which is an infectious disease caused by the John Cunningham virus (Ferenczy et al. 2012), which causes progressive damage or inflammation of leukocytes within the central nervous system (McCormack 2013; Nicholas et al. 2014; Stuve 2009). Gensicke et al. (2012) reported that there is a very low (1 in 1,000) risk of PML when receiving natalizumab therapy. Despite the chances of developing PML, natalizumab is a favourable treatment option for adults with highly active RRMS (McCormack 2013; Miller, Karpinski & Jezewski 2012; Nicholas et al. 2014). The potential benefits of decreasing the progression of disability, stabilising the neurological symptoms and increasing the quality of life must be weighed against the risk associated with PML, which is often a fatal illness.

Natalizumab is sold under the brand name Tysabri (manufactured by Biogen Idec and Elan Pharmaceuticals) and it is now available as an infusion therapy in several countries. Tysabri was developed in 2004 in the United States and approved by the Food and Drug Administration for the treatment of RRMS. After three months on the market, Tysabri was withdrawn because of the related incidence of PML on people with MS (Langer-Gould et al. 2005) and people with Crohn's disease (Bickston & Muniyappa 2010). It was released back onto the market in the European Union in 2006, after Tysabri was declared safe and well-tolerated over the long term for managing RRMS.

Natalizumab is a monospecific agent, which is a humanised monoclonal antibody directed against α 4-integrin adhesion molecules for the management of RRMS (Kamat et al. 2009; McCormack 2013; Stuve 2009). Clinical studies have shown that people with relapsing forms of MS who receive natalizumab infusions have positive outcomes from the treatment. A study by Polman et al. (2006) showed a decrease in relapse of up to 68% and a decrease of approximately 50% in the risk of disease progression compared to placebo treatment in people with MS. Recently, natalizumab therapy has demonstrated a beneficial effect in the treatment of MS by either inducing remission in disease activity or improving the quality of life.

Current literature and post-marketing studies to date have reported that natalizumab infusion is generally safe in a hospital setting. During clinical studies, although natalizumab was well-tolerated with a positive safety profile, less serious adverse events were well-documented (Hellwig et al. 2008; Polman et al. 2006; Totaro et al. 2014). The commonly reported adverse events were headache, fatigue and mild infection (such as urinary tract infection). Polman et al. (2006) confirmed that most of these adverse events were manageable and only resulted in a reduction in the infusion rate. In addition, in a study by Hellwig et al. (2008), it was reported that these adverse events may be prevented by combining a low dose of intravenous steroids and antihistamines. Healthcare professionals must consider the frequency of adverse events during natalizumab infusions. Moreover, Stuve and Cutter (2014) noted that the activity of the disease is difficult to detect in many natalizumab recipients, due to a need for long-term data to observe potential long-term benefits. Over the last ten years, many studies have documented the use of natalizumab infusion therapy in people with RRMS in OITS (Kamat et al. 2009; Miller, Karpinski & Jezewski 2012; Polman et al. 2006; Totaro et al. 2014; Van Pesch, Sindic & Fernandez 2016).

Delivery of home care

The treatment of infusion therapy to chronically ill patients has traditionally been delivered in an OITS setting and supported by clinical practice policies. However, the practice of home infusion therapy is a practicable alternative to OITS not only because of the cost benefits but because it keeps patients away from the hospital setting (Gardner et al. 2003). Internationally, home infusion treatment programs have been established because of the need to reduce the demand for inpatient and outpatient hospital services, to decrease the risk of infections and to control costs (Snelling 2008). From the patient's perspective, an important benefit is the convenience that comes with having therapy in the home. Baharoon et al. (2011) and Stephens (2013) highlighted that patients who received treatment through such programs reported that it is far more convenient than going into hospital. In other words, people with chronic health conditions experience benefits from receiving care in their own home. In Australia, several hospitals have implemented the hospital at home model of care and refer to it as hospital in the home (HITH). Home infusion therapy has been used for multiple treatments such as antibiotic infusions, analgesia, hydration, chemotherapy and antineoplastic agents. In a systematic review, Shepperd et al. (2009) described HITH as enabling early discharge prevention of re-admission from hospital to home to continue medical treatment. In addition, they stated that a variety of patients could be treated under the HITH model of care based on their medical condition, including infection, post-surgical acute care and infusion therapy.

Research problem and study context

People with RRMS generally have to undergo regular disease-modifying therapies via OITS. Though there are many disease-modifying therapies with different benefits, natalizumab is commonly used for RRMS (Kappos et al. 2007). Additionally, people with MS who receive natalizumab require admission to OITS for at least a one-hour infusion every month. The admission appointment means that people often miss work or other activities on the day that they come to hospital to receive infusion therapy because of the additional time required in preparation for the appointment. While the majority of people with MS receive disease-modifying therapies via OITS, some drugs have a safety profile approved for administration in the home care setting. For example, Ducharme, Pelletier and Zacharias (2010) confirmed that infliximab therapy is safe to administer in the home setting for people with Crohn's disease.

As a registered nurse who has worked in an acute care hospital, I believe that people with chronic illnesses who require regular infusions may want to have a choice of where this treatment is delivered, such as in the home environment. In the Australian healthcare system, acute care patients may be able to access a 'hospital in the home' (HITH) service. This service offers patients the alternative of being treated in their own home. However, this service is not yet offered for people with chronic disease such as those with RRMS. Therefore, there is a need for a study to gain a deeper understanding and overall view of patients' and healthcare workers' experiences of the delivery of natalizumab in a home setting.

Aim of the study

This study is part of a larger project that examined the safety and clinical effectiveness, acceptability and cost effectiveness of flexible delivery of natalizumab by ambulatory care nurses for people with multiple sclerosis (Schultz et al. 2018). This project has been reported in the *Journal of Infusion Nursing*, in an article titled 'Developing a model of care for home infusions of natalizumab for people with multiple sclerosis' (see [Appendix I](#)).

The aim of this study is to explore and describe the experiences of people diagnosed with RRMS and healthcare workers in the transitioning of natalizumab infusions at home. The outcome of this qualitative investigation will provide healthcare professionals and policy administrators with the groundwork for overcoming obstacles surrounding these patients' experiences and for improving the model of care for treating people with RRMS.

Research questions of the study

This Master of Research by publication involves two stages (in two separate publications) as follows:

- The first stage of this study aims to understand the experiences of people with MS who received infusions of natalizumab at home instead of in hospital. This study focused on the research question: ‘What are patients’ experiences of natalizumab treatment in a home environment?’ There have not been any previous qualitative inquiries into patients’ perspectives on a changed model of care from outpatients to the home for the infusion of natalizumab. Studying the qualitative evidence may provide a clearer understanding of what it is like for patients to receive natalizumab infusions at home.
- The second stage of this study explored healthcare workers’ experiences of delivering natalizumab infusions in a home environment. The study question was: ‘What are healthcare workers’ experiences of delivering natalizumab infusions in a home environment?’

Significance

Currently, people with RRMS receive natalizumab intravenous infusions only through OITS. OITS administration of natalizumab treatment is becoming a widespread practice alternative to hospital inpatient treatment. The treatment cannot be given through an alternative route of administration, such as in the form of oral tablets. Natalizumab infusion is one aspect of comprehensive care received by people with RRMS; patients are taken care of by special healthcare teams and specific treatment programs. The main objective for management of people with RRMS is to give them the highest possible quality of life and to enable them to fulfil basic daily activities with no obvious signs of physical disability (Miller, Karpinski & Jezewski 2012).

Using the hospital in the home (HITH) model to offer people with RRMS natalizumab infusions in the home could be one step forward to achieving this objective. There has been one study conducted at the William C. Baird Multiple Sclerosis Centre in Buffalo, New York that used a phenomenological methodology to investigate the experiences of individuals diagnosed with RRMS receiving natalizumab infusions in clinical settings (Miller, Karpinski & Jezewski 2012). However, no previous qualitative research has focused on patients’ experiences of receiving the infusion in their own home.

Thesis outline

The thesis is organised as follows.

Chapter One provides an introduction to the topic under investigation and to the research project.

Chapter Two presents a review of the previous and the current literature, which includes a summary of the current state of healthcare services in Australia.

Chapter Three describes the research paradigm, focusing on the exploratory-descriptive study design.

Chapter Four consists of a peer-reviewed article published in the *Australian Journal of Advanced Nursing*, titled ‘Patients’ experiences of natalizumab treatment in a home environment: a qualitative study’.

Chapter Five presents an article submitted for publication, under review by the *Australian Journal of Advanced Nursing*, titled ‘Healthcare workers’ experiences of transitioning natalizumab infusions for multiple sclerosis patients from hospital services to an in-home setting: a qualitative study’.

Chapter Six provides an overview of the results and discusses the contribution of the thesis to the broader literature on a changed model of care from outpatient to the home for the infusion of natalizumab.

Summary of the chapter

Chapter One introduced the study by outlining some background information about MS and natalizumab therapy and placing it within the study context. People with MS come to hospital on a monthly basis to receive natalizumab infusions via an outpatient department service. An alternative option is to deliver this treatment in a home setting. This chapter set out the aim of the study, namely to inform the development of models of care that enable a patient-centred care approach for those who are required to participate in long-term care. In addition, the chapter set out the research question and the significance of the study. The chapter concluded with the thesis structure.

Chapter Two: Literature review

Chapter Two presents a literature review that was used to set the background for the study and publications. The focus of the literature review was to explore the existing research on patients' experiences of infusions within traditional hospital care and in alternative home care. A broad literature search was undertaken to identify any gaps in the current research. Prior to conducting the research, a preliminary search strategy was used to prepare for the study and to gather information related to the research topic.

Searching the literature

Searching electronic databases for literature requires an inclusive search strategy to achieve an accurate outcome (Whittemore & Knafl 2005). In this study, the search strategy was directed by systematic reviews conducted by Shepperd et al. (2016) and Langer-Gould et al. (2006) to ensure that new studies were captured. A consultation with a librarian offered an opportunity to review the keywords used and to obtain information about each database system, prior to undertaking the search.

In this study two electronic databases, the Medline database and the Cumulative Index to Nursing and Allied Health (CINAHL) database, were used in the search for available literature. These databases are common databases used in the healthcare field and were an efficient method of identifying studies on the index terms used. LoBiondo-Wood and Haber (2006) recommended making use of at least two electronic databases to answer a study question. However, other relevant literature was also found through websites such as Google Scholar, international institutes (including ProQuest Dissertations), and the National Library of Australia (including Trove). A specific time frame was selected because studies into patients' experiences of infusion therapy in the home commenced in the 1980s and the literature from this period is still significant.

Articles had to be available in English for ease of reading and evaluation. As stated above, the search started by using keywords from the works by Langer-Gould et al. (2006) and Shepperd et al. (2016), to detect relevant literature in the database. The key words used for article 1 were multiple sclerosis, model of care, patient-centred, home infusion and hospital infusion. While the key words for article 2 were model of care, healthcare worker, home infusion, multiple sclerosis and natalizumab. Consequently, the chosen terms were used to search the databases with a combination of 'OR' and 'AND'.

The search was conducted during the study period of August 2016 to March 2020. The titles and abstracts of all the sourced items were read. Identification of the literature around models of care and natalizumab therapy at home commenced with a search of the references cited in the keyword literature, reports from organisations such as the Multiple Sclerosis Society of Australia and Infusion Nurses Society and commonly referenced studies in the area. In addition, manual searching from the reference lists of previous studies was conducted and the search of electronic databases was updated frequently, as the study continued. It was identified that no qualitative studies of patient experiences of a changed model of care, from hospital to the home, for the infusion of natalizumab had been published.

Review of the literature

Studies have documented the experiences of people with RRMS in an outpatient service environment (Miller, Karpinski & Jezewski 2012). However, they do not state whether patients were offered home therapy, or if any patients requested home therapy. Moreover, there has been no study conducted on the experience of patients who choose to receive natalizumab infusions outside of the clinical environment. The following subsections further explore the literature on OITS and on home infusion therapy as an alternative model of care.

Current model of care: Outpatient intravenous therapy service (OITS)

OITS requires patients to travel to a hospital for therapy. It provides immediate access to specialists and medical equipment when necessary (Tice et al. 2004). The acronym ‘OITS’ is used to denote the settings in which intravenous therapy can be delivered without an overnight stay via a hospital admission. It therefore includes hospital-based ambulatory care clinics, infusion centres and long-term care facilities. In the community, OITS facilities are well-known and accepted methods of providing health care. In many countries, the OITS method of administering intravenous therapy outside hospital settings has grown rapidly within the healthcare system to deliver a better quality of care (Baharoon et al. 2011; Seaton & Nathwani 2000). This practice has been advanced for different reasons, including decreasing costs, technological advances in intravenous access and infusion pumps, the friendly environment and the accessibility of a skilled service. Moreover, this method of care delivery requires a team of healthcare professionals such as doctors, nurses and other staff to coordinate this service.

Intravenous infusion therapy has been delivered in a hospital setting since the 1970s (Alexander et al. 2011). Outpatient parenteral antimicrobial therapy was focused on delivering care to children

diagnosed with cystic fibrosis (Nazarko 2008; Tice et al. 2004). Since then, OITS has also involved adult patients diagnosed with medical illnesses, for example cellulitis, to minimise the length of hospital stay and the chance of re-admission (Higginson 2011). It was first developed to provide parenteral antimicrobial therapy and demonstrated a safe and effective delivery of treatment in an alternative setting. There is clear evidence that the management of chronic diseases in an outpatient department can promote positive outcomes, including safety, efficacy, cost effectiveness and patient satisfaction, as compared to in-hospital care (Alexander et al. 2011). In the United Kingdom, a survey-based study by Seaton and Nathwani (2000) supported the practice of OITS. They found that it provides significant advantages, including enhanced reimbursement and cost management, control, efficiency and convenience, and quality control. However, Seaton and Nathwani (2000) highlighted that OITS accounts for most of a hospital's therapy time and revenue but is not for all patient groups due to the complexity of their illness management. Following the same thread, Tice et al. (2004) supported the idea that the best choice for the model of care such as OITS is dependent on the patient's condition and available resources.

OITS provides care outside the hospital in a client-friendly environment that avoids obstacles such as isolation from friends and family and lack of privacy, while providing a wide range of IV therapies (Stephens 2013). There are many infusion therapies that can be provided by OITS, which include antimicrobials, chemotherapy, parenteral nutrition, IV fluids and monoclonal antibodies. Monoclonal antibodies have been developed for the management of people with MS and include natalizumab. Currently, intravenous natalizumab is routinely administered via OITS on a monthly basis in sessions that last one to two hours. When natalizumab is given in a clinical setting, for example at an OITS, it has shown a relatively high safety profile (Van Pesch, Sindic & Fernandez 2016). However, some monoclonal antibody therapies, for example infliximab, can be received in alternative settings, such as in the community or at home. Ducharme, Pelletier and Zacharias (2010) evaluated the safety of infliximab in a community setting and confirmed its safety using a standardised protocol. Therefore, it may be possible to provide an alternative setting to OITS, a non-traditional health care model, for instance, a home care setting.

Alternative model of care: Home care service

Over the past three decades, the use of an alternative model of care has grown worldwide using non-traditional 'in-home' settings. This model has advantages such as minimising the risk of acquiring hospital-associated infections and decreasing hospital stays (Snelling 2008). Hospital at home has been practised in developed countries, specifically, in the United Kingdom (Kane 2007), Europe (Berntorp

& Lethagen 2000), the Middle East (Baharoon et al. 2011), Canada (Moore & Bortolussi 2011) and Australia (Montalto 2010). However, despite HITH representing a new hospital system development worldwide, there is a significant gap in the literature, and the impact of home care services on clients and healthcare professionals has not been explored.

HITH involving infusion therapy has been an effective mode of management of patient illness at home since the 1980s (Stephens 2013). The use of home infusion therapy services has grown not only due to the development of advances in medical technology in infusion devices but also due to the development of new medications. Disease-modifying therapies, which include monoclonal antibodies, are part of these developments which can offer more effective, suitable treatment for people with chronic disease (Kappos et al. 2004; Stuve 2009). In some countries, such as Canada, certain disease-modifying therapies are provided to people in their own homes (Ducharme, Pelletier & Zacharias 2010).

Worldwide, natalizumab infusion is not yet routinely offered for in-home use. By contrast, this practice is accepted for other monoclonal antibody agents, such as infliximab therapy, with clear advantages in terms of safety, satisfaction and cost. Showing the growing trend to deliver monoclonal antibody therapy in a home setting, two studies in Australia have reported the safe delivery of natalizumab infusions in the home (Schultz et al. 2019; Vijayan et al. 2017). The delivery model is dependent on the patient's capability and need for medical services (Tice et al. 2004). HITH services, however, should be assessed in order to better understand the experiences of people with RRMS to inform the development, implementation and monitoring of services provided to such individuals and their family members.

Summary of the chapter

This chapter outlined that, in recent decades, research into home infusion therapy as an alternative model of care has grown. The chapter started by explaining the method of the review of relevant literature, through searching the electronic databases Medline and CINAHL. It also presented an outline of the current model of care of OITS and the preference for an alternative site for home infusion therapy.

The literature review highlighted a gap in the available studies, as no published articles were found that focused on patients' experiences of Tysabri treatment in a home setting. This study may add to the current knowledge about how home infusion services benefit patients and may be useful for

educating healthcare workers. The next chapter discusses the methodological approach used in this study.

Chapter Three: Overview of Methodology

The aim of this study is to inform the development of models of care that enable a patient-centred care approach for those who require long-term care. Ethics approval was granted by the Royal Adelaide Hospital Human Research Ethics Committee (see [Appendix 2](#)). As there is limited literature about the experiences of patients undergoing infusion in their own home, an exploratory-descriptive qualitative study seemed a suitable design to explore the patients' experiences and to generate a descriptive understanding of this phenomenon. The term 'phenomenon' was defined by Gerrish, Lathlean and Cormack (2015, p. 587) as 'an occurrence, circumstance, experience or fact that is perceptible to the senses'.

Qualitative research

Generally, a qualitative research study entails a non-experimental research design that uses data description to understand the meaning of a phenomenon. Qualitative research is an interpretative and critical approach, because it aims to define a concept and investigate a particular phenomenon of interest (Gerrish, Lathlean & Cormack 2015). This is particularly important when conducting a social inquiry about individuals' experiences within their natural setting. Currently, qualitative research is used in many different fields, including nursing research. Mason (2002) emphasised that there is no common definition of qualitative research; however, the recent definition from a nursing perspective by Polit and Beck (2016) suits the purpose of this research. Polit and Beck (2016, p. 741) defined qualitative research as 'the investigation of phenomena, typically in an in-depth and holistic fashion, through the collection of rich narrative materials using a flexible research design'. In other words, it generates an understanding of an individual's opinion about their experience, by using a specific research design. Therefore, qualitative research offers descriptive information to understand the experiences, perceptions and opinions of the research participants.

To gain a deeper understanding and overall view of the patients' experiences, this study was conducted using a qualitative methodology. A qualitative approach allowed the researcher to gain knowledge of the phenomenon from the patients' and healthcare workers' own perspectives. Qualitative methods, in particular interviews and focus groups, were more suitable than quantitative methods for many reasons, since the research aim was to gain insight into the experiences of patients having treatment at home, rather than in a hospital. Using a specific qualitative research design not only requires an

understanding of the nature of the study, but also the type of questions considered to be appropriate. As briefly discussed below, there are different research methodologies that could have been employed, such as grounded theory, phenomenology and exploratory descriptive.

Grounded theory study

A grounded theory study creates a theory about a phenomenon through a systematic process. In grounded theory, ‘the investigator develops conceptual categories from the data and then makes new observations to develop these categories’ (Bowling & Ebrahim 2005, p. 603). It is designed to focus on a process related to an idea and uses this process to create a theory from the opinions of the participants. Grounded theory is designed to collect and analyse data from an observational field. As the aim of this study was not to develop a new theory, a grounded theory study would not be an appropriate design for this research.

Phenomenology study

While grounded theory focuses on discovering a new theory through data collection, the intent of a phenomenology study is to describe the meaning behind the participants’ lived experiences. The design aims to provide detailed information on the meaning of individual daily experiences, but also to describe and reflect on them (Gerrish, Lathlean & Cormack 2015). Borbasi and Jackson (2012, p. 257) indicated that the purpose of a phenomenology design is ‘to understand and attribute meaning to the phenomenon of interest’. As a phenomenology study requires in-depth interviewing with participants to understand the deeper meaning of their lived experience, rather than a briefer exploration of the patients’ experiences of natalizumab treatment in a home environment, it was not an appropriate methodology for this research. The researcher determined that an exploratory-descriptive study design was the best method to use when conducting this study. In the next section, exploratory-descriptive study design will be discussed in more detail, including references to the literature.

Exploratory-descriptive study design

An exploratory-descriptive study design is a common qualitative methodology. It is also classified as ‘qualitative research with content analysis’, ‘qualitative inquiry’, ‘qualitative research’, or a ‘qualitative study’ by some researchers (Annells 2007, p. 223). However, the different terms used vary depending on the nature of the phenomenon under investigation. Currently, an exploratory-descriptive study is the most common approach to qualitative research in the nursing field (Annells 2007; Polit & Beck 2016; Schneider et al. 2013).

An exploratory-descriptive study is the exploration of human experiences to either investigate new ideas or increase knowledge of a phenomena Reference. Schneider et al. (2013, p. 392) explained this design as ‘an “overarching” process whereby researchers do not adopt a traditional philosophical or theoretical methodological stance but, instead, use a “free form” approach that adopts general principles of qualitative process, such as common data collection and data analysis styles’. There are advantages to using this design for this research question. Firstly, it is an ideal design to gather individual experiences. Secondly, it is a way of exploring and describing the participants’ experiences during the period of study. Finally, it allows the researcher to explore the phenomenon of a change to a model of care, and collect descriptive data on patients’ and healthcare workers’ experiences. Therefore, this design was considered the most appropriate approach for this study. As stated above, the freedom within this design allows for the gathering of data from individuals in face-to-face interviews or focus groups, and the use of a thematic method to analyse the data. The specific research methods for each phase of the study are outlined in detail in Article One (Chapter Four) and Article Two (Chapter 5). The interview questions can be found in [Appendix 3](#).

Summary of the chapter

The qualitative research paradigm and philosophical aspects of research designs were briefly explored in this chapter. While there are different research approaches, for example grounded theory and phenomenology, an exploratory-descriptive design was considered the most appropriate for this study to explore the phenomenon of MS patients’ experiences of having natalizumab infusions in their own home as an alternative model of care. Also, it will offer knowledge about healthcare workers’ experiences in delivering infusions in a home setting. The research design and the rationale for choosing this method of enquiry were explained in this chapter. The researcher decided on this approach to examine a relatively unstudied field, with limited current information available on the subject. The next chapter will present the first published article: ‘Patients’ experiences of natalizumab treatment in a home environment: a qualitative study’.

Chapter Four: Article one

Statement of authorship

Statement of Authorship

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Name of Principal Author (Candidate)	MAHASEN JUATON		
Contribution to the Paper	Conception and design, data collection and analysis, manuscript preparation, and the corresponding author with the journal.		
Overall percentage (%)	60%		
Certification:	This paper reports on original research I conducted during the period of my Higher Degree by Research candidature and is not subject to any obligations or contractual agreements with a third party that would constrain its inclusion in this thesis. I am the primary author of this paper.		
Signature		Date	11 May 2020

Co-Author Contributions

By signing the Statement of Authorship, each author certifies that:

- i. the candidate's stated contribution to the publication is accurate (as detailed above);
- ii. permission is granted for the candidate to include the publication in the thesis; and
- iii. the sum of all co-author contributions is equal to 100% less the candidate's stated contribution.

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Patients' experiences of natalizumab treatment in a home environment: a qualitative study

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ABSTRACT

Objective: This study's objective was to understand the experiences and perspectives of people with multiple sclerosis who received infusions of natalizumab at home instead of the tertiary hospital day unit.

Background: Continually returning once every four weeks to an out-patient department to complete an intravenous infusion can be taxing for chronic disease patients. In Australia, acute care patients may be offered hospital in the home service. In-home services are delivered by highly qualified, trained nurses following the infusion protocols similar to that of the hospital. However, this service is not yet offered for chronic disease patients, such as those with relapsing remitting multiple sclerosis.

Study design and methods: An exploratory-descriptive study that incorporated face-to-face audio-recorded interviews of people with multiple sclerosis was undertaken as part of a larger study that trialled delivery of natalizumab at home instead of the hospital day unit. The interviews were conducted at the Ambulatory Care Day Unit of a hospital following a period of three natalizumab infusions in participants' homes. Twelve people with multiple sclerosis (two males and 10 females) aged between 18–56 years participated in this study.

Results: A main theme of 'patient-centredness' that describes the positive contribution of having patients at the centre of care when delivering home infusions emerged. This encompassed three subthemes: 'in the comfort of their own home', 'convenience for patients and their families' and 'saving time and money'. Patient-centred care was an important part of the model of care because it provided flexibility for the participants in managing their home and work-life commitments.

Discussion: Although home infusion therapy requires a healthcare team approach, this study's findings demonstrated that delivering patient-centred home infusions provided satisfaction for people with multiple sclerosis. This enabled natalizumab to be delivered at patients' preferred time in the convenience of their own home.

Conclusion: If models of care are to be truly patient-centred, the convenience of the location of the delivery of safe treatment must be a consideration into the future design of services for those with long term health issues such as multiple sclerosis.

Implications for research, policy, and practice: Patients should play a role in the planning of their care and infusion nurses should be flexible in

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negotiating and delivering appropriate care. Future research could consider the experiences of the home infusion team.

Key words: Multiple sclerosis, model of care, patient-centred, home infusion, hospital infusion

What is already known about the topic?

People with multiple sclerosis come to hospital on a four-weekly basis to receive natalizumab infusions via an out-patient department service.

Home infusion programs have been established to stem the increasing demand for acute care hospital beds.

What this paper adds:

Home natalizumab infusions were accepted by the participants, particularly because of the convenience involved.

The study contributes to patient-centredness of home infusions, which may improve the health and wellbeing of people with multiple sclerosis.

INTRODUCTION

Out-patient intravenous therapy service is well established and is considered to be a standard of care for antimicrobial therapy.¹ However, improved care for chronic disease patients who receive regular intravenous therapy should emphasise minimising and avoiding out-patient hospital admissions, so that patients do not miss work or other activities on the day of their infusion therapy.² Around 2.5 million people have been diagnosed with multiple sclerosis (MS) worldwide, including over 23,000 people in Australia.^{3,4} One of the first targeted disease-modifying therapies approved for the treatment of adults with Relapsing Remitting Multiple Sclerosis (RRMS) is natalizumab.⁵⁻⁸

BACKGROUND

Internationally, home infusion treatment programs have been established to stem the increasing demand for acute care hospital beds, decrease the risk of infections and control costs.⁹ From the patient's perspective, the convenience that comes with having therapy in the home is an essential benefit. Patients who received treatment through such programs reported that it is far more convenient compared to the hospital and that people with chronic health conditions experience benefits while receiving care in their own home.¹⁰ Others emphasised that the calmness of the home environment and good home coordination provided a lesser impact on patients' lives that resulted in a positive patient experience.^{2,11} This 'convenience' links to patients' acceptance of home infusions.¹² In the Australian healthcare system, acute care patients may be offered 'hospital in the home' (HITH) service.¹³ However, this service is not yet offered for chronic disease patients such as those with RRMS. In other countries, this practice is accepted for other monoclonal antibody agents, such as infliximab therapy, with clear advantages in terms of safety, satisfaction and cost.¹⁴ Other recent international studies have published abstracts for natalizumab home infusions. In the United Kingdom, a pilot study concluded significantly higher levels of satisfaction with home infusion service on 10 MS patients.¹⁵ Although

natalizumab was well-tolerated with a positive safety profile, less serious adverse events, such as elevated temperature, were well-documented. Another study in Australia has documented the first at-home natalizumab infusion service in which 34 patients received nearly 494 doses in total at home.¹⁶ This study concluded that participants' satisfaction was achieved without compromising their safety; while this is an important finding due to the potential for adverse events early in natalizumab treatment, further detail about participants' experiences is unknown.

However, patients receiving natalizumab therapy have the risk of developing progressive multifocal leukoencephalopathy (PML), which is an infectious disease caused by the John Cunningham virus that causes progressive damage or inflammation of leukocytes within the central nervous system.¹⁷ Despite the chance of developing PML, natalizumab is a favourable treatment option for adults with highly active RRMS.^{5-7,18} The potential benefits of decreasing the progression of disability, stabilising the neurological symptom and increasing the quality of life must be weighed against the risk associated with PML.

Offering in-home natalizumab infusion could improve the quality of life, enhance patient centredness, and allow people with RRMS to fulfil basic daily activities. Having the patient at the centre of care should be beneficial in meeting their needs. Patient-centred care is defined as 'providing care that is respectful of, and responsive to, individual patient preferences, needs and friends, and values, and ensuring that patient values guide all clinical decisions'.¹⁹ One North American study used phenomenological methodology to investigate the experiences of patients diagnosed with RRMS receiving natalizumab infusions in clinical settings.¹⁸ The study showed that participants felt that natalizumab treatment improved their quality of life. However, no previous report has focused on patients' experiences having the natalizumab infusion at their own home. In order to explore and describe the participants' experiences and perspectives of home infusion, the research question: 'What are the patients' experiences of natalizumab treatment in a home environment?' guided the study.

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METHOD

This paper presents the qualitative component of a larger study on the safety and clinical effectiveness, acceptability and cost effectiveness of home infusions of natalizumab for people with multiple sclerosis.^{20,21} An exploratory, descriptive approach to explore the patients' experiences of receiving treatment at home and to generate a descriptive understanding of this phenomenon was used. A descriptive understanding in the qualitative study is the exploration of human experiences to either investigate new ideas or increase knowledge of a phenomena. Schneider explained this context as 'an 'overarching' process whereby researchers do not adopt a traditional philosophical or theoretical methodological stance but, instead, use a 'free form' approach that adopts general principles of qualitative process, such as common data collection and data analysis styles'.²²

SETTING AND PARTICIPANTS

The study was based in an Ambulatory Care Day Unit (ACDU), an 11 bed out-patient unit of a major metropolitan hospital in Adelaide, Australia, catering to approximately 26 out-patients per day. Ethical approval was provided by the Royal Adelaide Hospital Ethics Committee (HREC/16/RAH/192). Using convenience sampling 12 participants were selected from 37 consenting participants from the larger study, recruited using the following inclusion criteria:

- Adult MS patients (≥ 18 years)
- Medically stable
- Have been risk assessed as safe for the flexible infusion delivery program by the prescribing Neurologist
- The patient has had a minimum of six natalizumab infusions
- John Cunningham Virus negative
- Comply with other vigilance requirements – Tests such as, MRI are done to identify the disease activity. In addition to clinical signs and symptoms, new lesions found in MRI indicate relapse and disability progression.²³
- Have completed three natalizumab infusions at home as part of the larger study

DATA COLLECTION/ANALYSIS

A semi-structured interview was carried out during the participants' natalizumab infusions at ACDU, as this was a convenient location for participants to be interviewed. The interviews took between 20 and 60 minutes and were audiotaped. While most interviews were carried out within two months of the participants' last home infusion, a few interviews occurred more than two months after the last in-home infusion, due to the participants' appointment times and the researcher's availability. The recordings were transcribed and the transcripts were analysed using Braun

and Clarke's approach to identify, analyse and report the main findings. In other words, the researcher focused on the content of the transcripts, then identified common themes.²⁴ This approach involved grouping of concepts, supported with quotes from the participants' interviews. The transcripts were also reviewed and themed by a second researcher to build in a trustworthiness measure.

FINDINGS

DEMOGRAPHICS CHARACTERISTICS

Twelve multiple sclerosis patients participated in the face-to-face interview. Most participants were female (n=10), married, and aged 36-45 years (Table 1).

TABLE 1: DEMOGRAPHIC CHARACTERISTICS OF 12 INTERVIEW PARTICIPANTS

Characteristics		Number
Gender	Male	2
	Female	10
Age range	18-25	1
	26-35	2
	36-45	6
	>46	3
Marital status	Single	3
	Married	7
	Divorced	2
	Widow	0
Work status	Yes	5 (Part time)
	No	7

THEMATIC ANALYSIS

A main theme of 'patient-centredness' emerged. This described the participants' overall experience of natalizumab infusion at home instead of the tertiary hospital. This encompassed three subthemes; in the comfort of their own home, convenience for patients and their families and saving time and money.

Main theme: Patient-centredness

All participants acknowledged that it was a positive experience not only for themselves but also for their family members. The nursing care was responsive to them as an individual and not just the treatment of the condition. Priorities were focused on patients' and their families' needs and acknowledgement of patient autonomy and involvement in determining the timing and location of their care.

Subtheme one: In the comfort of their own home

This sub-theme explains what it means for participants to have natalizumab as an option of care at home. Participants

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expressed the advantages of being comfortable during treatment at home because it fitted in with their daily routine such as having family around.

'Yeah, in my favourite chair, with my feet up, with a cup of coffee and kids – my daughter was making coffee, and my granddaughter was just playing with her toys.' (ID 11)

All of the participants expressed that they had a more pleasant experience receiving natalizumab infusion at home. Participants were very appreciative of having this model of care as an option, as one participant mentions:

'It has been a really pleasurable experience, so thank you for including me. Yeah, definitely, it's been a great experience for me.' (ID 34)

Although the participants identified advantages of having the infusion at home, one particular participant mentioned that there was a benefit of having the treatment at hospital, which allowed the participant to separate their MS condition from their home life:

'...at the moment having it at the hospital, I come to the hospital and I think about MS when I'm at the hospital but when I go home I don't have to think about it anymore.' (ID 5)

One of the consistent feelings expressed by participants was of being less stressed while having treatment at home. This was because attending hospital for an appointment and then returning home did have particular anxieties for some participants that caused them to feel stressed:

'At home, it's less stressful. I suppose it's just you're in an environment that you know. So up here [hospital], it's not so much the stress once you get here, it's the stress of getting here and then getting home too.' (ID 46)

When exploring the benefits of the home model of care, participants indicated that being at home was less stressful because they felt more relaxed and calmer.

'It was just nice and relaxed. I could just get up. I could have my water...prepare myself. I didn't feel nauseous or anything.' (ID 12)

Another participant mentioned that access to the medication was more important than travelling to the hospital for the natalizumab infusion:

'Because I love the drug so much and that is my ultimate priority, as long as I get it I don't care where I get it, ... that is the ultimate goal. As far as location, it really doesn't matter because ... coming here is really a no-brainer.' (ID 21)

Subtheme two: Convenience for patients and their families

The convenience felt by the participants was a result of ease in managing appointments which benefited them and their family members. The convenience of home infusions reduced the difficulties associated with natalizumab treatment in a hospital setting.

Participants' indicated that home infusions gave them a sense of control and autonomy over the appointment time for their therapy. Upholding dignity and integrity through decisional autonomy provides participants a sense of control over appointment times that fit into their routine, whether that be their work or home lives:

'I think I would just say it's easier to work, especially if the nurses are prepared to come later in the day, and you have your infusion before dinner or whatever, it's more convenient for your work.' (ID 3)

To some extent, managing appointments fundamentally helped participants to maintain a sense of control over their lifestyle:

'Having it in a time that I can manage and help manage my family life is important. Yeah, so I can make the treatment fit in with my life, rather than my life fitting in around my treatment.' (ID 34)

It is clear from participants' experience that having home infusions benefits everyone. Some participants viewed home care as freeing up space at the hospital for people who are acutely ill.

'It benefits, I think, everyone. It benefits the patients, but it also benefits the hospital because there's three or four people that – in a day, I suppose, I don't know how many would come up on the same day. But it just frees up that space as well.' (ID 46)

Another participant highlighted the benefits at workplace.

'As I said about [my work], I didn't have to leave early and disappoint the [students], or get a reliever or anything like that.' (ID 5)

Others mentioned that having home infusions was suitable for their family commitment, as they could continue with their usual daily activities in their own environment.

'...You probably get the same from everybody. It was really convenient with my lifestyle, with work and kids and everything.' (ID 20)

Subtheme three: Saving time and money

Although a natalizumab infusion only takes an hour in a hospital setting, most of the participants claimed that it is almost a day spent in hospital. Some participants or their family members need to take a day off work to accommodate the treatment. This will then impact on them having to make up the day lost or have lesser pay. Others have to spend extra money to have their children looked after by a carer during treatments. This subtheme documents the participants' perceptions of home infusions in terms of the saving time and money.

Most of the participants reported that they felt that the infusion went 'quicker' compared to the hospital service.

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'So yeah, I think it – it went fairly quickly anyway but I think it went quicker because I wasn't sort of aware of it as much.' (ID 34)

Travelling time represents the participants' experience of travelling to and from the hospital for their appointment, which was an issue that all participants verbalised. Most of the participants were also concerned about parking their car, the level of traffic on the inner city roads, and rushing to the hospital to be on time for appointments. Participants indicated that one of the main benefits of the home model of care was eliminating the need to travel to and from the hospital:

'...You don't have to worry about the time it takes to travel in and to travel home. I much prefer it at home.' (ID 11)

Saving money is one of the benefits identified from receiving home infusions. Participants mentioned that staying at home was beneficial as they do not have additional costs for petrol, parking, television rental and food.

'You're spending less money on petrol and parking, which is a big drama.' (ID 3)

In addition, they also mentioned that they did not need to take time 'off' from work, which also related to cost-effectiveness.

'I think that – so it didn't cost me anything to be able to have it at home.' (ID 5)

DISCUSSION

Patients' perspectives and evaluation of service delivery within the healthcare system should be focused on what they find important.^{2,25} Ducharme, Pelletier and Zacharias have reported that 'restrictions' and 'inefficient care' leads to inconvenience for patients.²⁶ Trialling a model of care for home infusions of natalizumab, which was the focus of the larger study, was in response to the changing expectations of patients' as well as the evidence of the safe infusion of natalizumab in the community away from the acute health service. The findings from this study aided the understanding of how people with MS appreciated and benefited from the care provided. This was supported by the participants' interviews and their aspiration of having a permanent home infusion delivery. Overall, the study indicated that being at home while receiving natalizumab infusions supported a patient-centred care approach by offering convenience for patients with RRMS and their family members. In addition, this provides a valuable insight for nurses delivering in-home treatment. Given the pivotal role of nurses within an in-home service, further qualitative study exploring their experiences with the concept of patient-centred model of care would be beneficial.

PATIENT-CENTREDNESS

In our study, the flexibility and ease in which the participants could arrange their appointments' was highlighted. They were able to make re-bookings easily by messaging the infusion nurse and having their natalizumab treatment at an agreed time and place. One of the dimensions of the MS relapse management scale to measure patient care is 'access to care'.² During the participants' home infusions, they mentioned that they had their four-weekly infusions in a time and place that suits them, as the home infusion team upheld flexibility with the appointments. Also, they noticed that the infusion went quicker compared to the ones at the hospital. This may be due to the 1:1 ratio of patient-nurse in the home, therefore enabling the immediate and total attention of the nurse, where the main focus was patients' safety and comfort. The home treatment was more physically and emotionally comfortable. This finding is supported by international studies, which found that because of the initial impression of comfort, the majority of participants elected to change to in-home infusions.^{2,10-12}

The second dimension of the MS relapse management scale is 'coordination of care', which relates to this study's subthemes 'in the comfort of their own home', which emphasised the advantages of participants being more comfortable and less stressed in their own home during the treatment. This is consistent with findings from other home therapy survey studies. In Italy, a survey of adults receiving enzyme replacement therapy for lysosomal storage disease found that the majority of participants favoured in-home therapy, indicating that they experienced less stress, increased comfort and less impact on family life during the treatment.²⁷ Given the relationship between stress (at work or life events) and relapse for people with MS,²⁸ reduced stress may reduce the risk of relapse, which is very important to patients with MS.

Acknowledging patients' comfort and empowering patients' and family members' involvement with the plan of care can lead to a higher level of patient compliance with their treatment.²⁹ Consistent with the trends in other in-home treatment models, convenience for patients and their families made a significant difference to their experiences of infusion therapy in the home setting. A number of studies have demonstrated that receiving IV therapy at home will increase patient compliance with their treatment.^{11,29-31} Being in hospital for infusions presents obstacles for MS patients, which may be addressed by providing alternative services, such as infusion therapy at home.

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LIMITATIONS

The participants of this study consisted of RRMS patients who were currently receiving infusions at a single, metropolitan, tertiary hospital. The results may not be generalisable to other groups of patients and other MS patients at other hospitals and countries due to geographic and social differences.

CONCLUSION

This is the first research on the experiences of people with MS receiving natalizumab in the home environment. This study supports health services to consider different models of delivering care for patients with chronic conditions, such as MS, requiring regular infusions. Delivering the infusion in an environment of the patient's choice does enhance their wellbeing, physically, emotionally and financially. The convenience, comfort and saving time and money of in-home treatment were the most important parts of the experience that contributed to a patient-centred approach. Therefore, this study encourages adopting in-home infusion therapy as an ongoing model of care to support MS patients' health and wellbeing within their own familiar environment, ensuring their lifestyle remains as routine as possible.

RECOMMENDATIONS

To ensure patient-centredness, the infusion nurses and the support team should discuss the patients' and families' needs when receiving infusions in the home. Depending on the situation, patients should play a role in the planning of their care and infusion nurses should be flexible in planning and delivering the care. The study recommends important areas for future research, including:

As patients only were included, in future studies it would be useful to understand the experiences and opinions of their family members, including their involvement in care, using in-depth interview tools.

It would be beneficial to further explore if there are any additional benefits of home care to supporting the broader family unit.

It would also be useful to consider the experiences of the in-home infusion team during the period of in-home infusions.

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Chapter Five: Article two

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Co-Author Contributions

By signing the Statement of Authorship, each author certifies that:

- i. the candidate's stated contribution to the publication is accurate (as detailed above);
- ii. permission is granted for the candidate to include the publication in the thesis; and
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Cover page

TITLE

Healthcare workers' experiences of transitioning natalizumab infusions from hospital services to an in-home setting: A qualitative study

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Healthcare workers' experiences of transitioning natalizumab infusions from hospital services to an in-home setting: A qualitative study

Abstract

Objective

This study explored healthcare workers' experiences of transitioning infusions of natalizumab from hospital to a patient-centred model of home care

Background

Hospital in the home is one of the fastest growing healthcare delivery models. In Australia, intravenous infusions are rarely available at home for chronic disease patients, such as those with multiple sclerosis. A recent trial of natalizumab infusions at home for patients with multiple sclerosis required both the hospital and hospital in the home staff to consider the logistics of how this transition could be achieved safely.

Study design and methods

This was a qualitative study using an exploratory-descriptive approach. Twelve participants from two main groups of healthcare workers participated in delivering natalizumab infusions during the six-month trial period and were subsequently interviewed about their experience. Participants were recruited from a hospital ambulatory care day unit and a Home Infusion Team from a private provider of home nursing care located in South Australia. The data was analysed thematically.

Results

Three main themes were identified from the interviews: 'preparing for change', 'focussing on the patient', and 'enhancing professional support and relationships'. These findings demonstrated the importance of understanding healthcare workers' experiences of transitioning to a patient-centred model of care, from hospital to home infusion of natalizumab.

Discussion

Flexibility and good management of logistics is necessary to maintain the standards of the health services, which highlights the need for training and professional support to facilitate quality home care. This may enhance workers' sense of professional confidence and trust and reduce stress when delivering the home model of care.

Conclusion

Healthcare workers and patients worked to support one another, not only therapeutically but also logistically within collegial relationship and interdependent communications. Being flexible, communicating clearly and being willing to work together within the team, especially between the hospital in the home staff and the hospital staff, was demonstrated to be an important factor for the safe delivery of infusions at home. Managing the logistics of delivering a flexible and safe home therapy service was an important part of this model of care.

Implications for research, policy, and practice

The results of this study will be used to inform healthcare teams about the key logistical components that are important for healthcare services, when considering transitioning to a home-based model of care for treating people with relapsing-remitting multiple sclerosis.

Keywords

Model of care, healthcare worker, home infusion, multiple sclerosis, natalizumab

What is already known about the topic

- Although outpatient infusion programs are often hospital based, they may be run by regional health authorities or private organisations, such as a hospital in the home service.
- Healthcare workers delivering a hospital in the home service require advanced knowledge and skill in order to deliver quality care.

What this paper adds

- The development of a comprehensive logistical process, which has the patient at the centre of the model of care, enabled natalizumab to be delivered safely in the community by healthcare workers.
- Being flexible, communicating clearly and being willing to work together within the team, especially between the hospital in the home staff and the hospital staff, was demonstrated to be an important factor for the safe delivery of infusions at home

SUBMITTED

Introduction

Over 25,000 people in Australia have multiple sclerosis (MS), an inflammatory disorder of the central nervous system that may result in neurological symptoms and increasing disability.^{1,2} Multiple sclerosis is a chronic neurological disease that develops in young adults.¹ About three quarters of people with MS are female and the majority are diagnosed between the ages of 20 to 40 years.² Most people with MS start out with relapsing-remitting MS (RRMS), which is characterised by relapses or exacerbations when symptoms flare up, followed by a variable period of time when no symptoms are present, called 'remission'.³ Currently, the US Food and Drug Administration, together with the European Medicines Agency, have approved 13 drugs for use as RRMS disease-modifying therapies, which help to control the disease and improve quality of life.³ Gajofatto and Benedetti emphasised that these therapies modulate or suppress the different mechanisms of the autoimmune process that underlies the disease, thereby minimising the occurrence of relapse or preventing disease progression.⁴ Natalizumab was one of the first disease-modifying therapies approved for the treatment of adults with RRMS in a hospital setting.^{5,6}

Hospital outpatient intravenous therapy services, also known as hospital-based infusion centres, are gaining recognition as a beneficial model of care for both health services and patients.⁷ Patients diagnosed with RRMS may require natalizumab infusion treatments on an ongoing basis for at least a one-hour infusion every 28 days.^{8,9} Natalizumab infusions can be delivered to people with RRMS as an outpatient rather than requiring admission to the hospital as an inpatient. While this outpatient appointment is a relatively short hospital visit, patients still have to allocate sufficient time to travel to and attend the hospital for the treatment and may miss work, study and other activities on that day. This is time consuming and inconvenient, not only for the patients but also for their family members.^{10,11} Although outpatient infusion programs are often hospital based, they may be run by regional health authorities or private organisations. Several studies have recently supported the concept of delivering patient care, especially intravenous infusions, away from a hospital and in the patients' home or community environment. This places the patient at the centre of the delivery of the care rather than the hospital.^{11,12}

Background: 'Hospital in the home' model

Delivering health care for people with chronic health conditions at home is commonly known as 'hospital in the home services'.² 'Hospital in the home' involving infusion therapy has been an effective mode of management of some illnesses since the 1980s.¹³ The use of home infusion therapy services has grown not only due to the development of advances in medical technology for infusion devices but also due to the development of new medicines. The development of home infusion treatment programs has been influenced by the need to stem the increasing demand for access to acute care hospital beds, to decrease the chance of infections and to reduce hospital costs.¹⁴ Additionally, during the COVID-19 pandemic, the preference for people such as those receiving natalizumab for RRMS to avoid the hospital environment and self-isolate has increased the need for health managers to rapidly consider safer options for delivering ongoing medical treatment.

Disease-modifying therapies are part of a growing group of agents, which includes monoclonal antibodies, with the aim of offering more effective, suitable treatment for patients with chronic disease.⁴ In some countries, such as Canada, certain disease-modifying therapies are provided to people in their own homes.¹⁵ For example, infliximab therapy, a monoclonal antibody agent used for Crohn's disease patients has a safety profile approved for administration in the home setting. Three studies have reported that infliximab therapy for Crohn's disease is safe to administer in the home.^{15,16} In the United Kingdom (UK), a recent pilot study by Brex et al. on natalizumab home infusion reported significantly higher levels of satisfaction (94% to 100%) after delivering 253 home infusions on 10 highly active MS patients.⁸ Recent studies have piloted home infusions of natalizumab for people with RRMS.^{9, 17} Despite the possibility of adverse events due to natalizumab infusion, these studies stated that the participants' safety was maintained and that participants reported a high level of satisfaction. While these three studies documented important findings about the patients' experience of home care, clinicians' experiences of transitioning to and supporting a different model of care have not been studied. Given that healthcare professionals are potentially operating in a new environment, and working with a new model of care, it is important to understand their perspectives, how they may inform practice and the process of managing change. A search of the literature has identified

only one study conducted in the UK that used a qualitative methodology to investigate the experiences of district nurses caring for patients with home chemotherapy.¹⁸ The authors concluded that the experiences of nurses with home chemotherapy highlighted the importance of shared care with patients and learning from colleagues.

This article presents the findings from research which aimed to understand healthcare workers' (HCWs') experience of transitioning to a patient-centred model of care, from in-hospital to at-home, for patients with MS requiring monthly infusions of natalizumab. Moreover, this study may inform the key logistics of the delivery of home infusion services.

Method

The study was conducted using a qualitative methodology. The study question was: 'What are HCWs' experiences of delivering natalizumab infusions in a home environment?' An exploratory descriptive study design is common among qualitative methodologies, also known as 'naturalistic inquiry'.^{19(p479)} There were advantages to using this design for this research question. Firstly, it is an ideal design to gather individual experiences during the period of study. Secondly, the researchers sought to gain a deeper understanding of the HCWs' experiences of the model of care used in the home environment. The research was approved by the relevant health service Hospital Ethics Committee (HREC/16/RAH/192) and all participants provided written informed consent before commencing.

Setting and participants

This study is the qualitative part of a larger study that examined the safety, clinical effectiveness, acceptability and cost effectiveness of home infusions of natalizumab for people with MS.⁹ Twelve participants from the two main groups of HCWs delivering natalizumab infusions during the six-month study period were interviewed: four from the Home Infusion Team (HIT) (a private provider of home nursing care located in South Australia) and eight from a tertiary hospital ambulatory care day unit.

Data collection/analysis

A total of 110 natalizumab infusions were provided to 36 RRMS patients during the six-month period April to September 2017, of which 55 infusions were delivered at patients' homes and another 55 at the ambulatory care day unit.^{9,20} Semi-structured interviews were conducted with the HCWs after the completion of the period of delivering natalizumab home infusions. The participants were given a choice between participating in a telephone or a face-to-face interview, either individually or as a group. The interviews took between 30 and 60 minutes and were digitally recorded. The recordings were transcribed and participants were given the option to check the transcripts. None of the participants requested to review their transcript.

The transcripts were analysed using Braun and Clarke's method.²¹ In this analysis, the researchers focussed on the content of the transcripts, then identified common themes. This approach involved grouping concepts, supported by quotations from the participants' interviews.

Issues of reliability and validity

Reliability and validity are important components in conducting research. In qualitative research, validity and reliability are maintained by establishing trustworthiness. Trustworthiness can be demonstrated through the process of gathering data.²⁵ For this study the same semi-structured questions were used for all participants and two researchers independently analysed the transcribed recordings and then came together to discuss the findings. In addition, the research team met monthly throughout the data collection period. Finally, the researchers maintained an audit trail of the study, keeping a record of the materials used, and the process of data collection and analysis.

Results

The framework that guided the analysis of the data was dictated by the study question. Three main themes were identified from the interviews: 'preparing for change', 'focussing on the patient', and 'professional support'. These are presented in Table 1. In the descriptions of each theme, participants are referred to by a letter and a number,

such as H2, at the end of each comment. The HIT HCWs (nurses and courier) are identified with the letter H. The ambulatory care day unit HCWs (consultant neurologist, neurology nurse consultant, nurse unit managers and nurses) are identified with the letter R if they were individually interviewed or the letter F if they were interviewed in groups.

Table 1: Outline of themes and subthemes from HCWs' experiences

Theme	Subtheme
Preparing for change	Comprehensive process of preparation for change
	Extra work in facilitating the change
	Ensuring the cold chain is maintained
Focussing on the patient	Convenience for the patient
Enhancing professional support and relationships	Training
	Positive collegial relationships
	Nurse-patient relationships

Theme one: Preparing for change

The importance of establishing a clear process that ensured safe patient care was a pervasive theme among the HCWs. This theme has three subthemes: 'comprehensive process of preparation for change', 'extra work in facilitating the change' and 'ensuring the cold chain is maintained'.

Subtheme one: Comprehensive process of preparation for change

It was clear from the participants' experiences, across both the hospital and home care staff, that there was a lot of consideration during the planning and intervention phase of the project, which aimed for accurate documentation and patient safety. Participants mentioned that the process was well documented and comprehensive:

I think for the purpose of the trial, there was a lot more ... tracking, and you could audit all of that. It was very comprehensive. Probably more comprehensive than we would normally do. (F3)

With regards to the patient recruitment process, participants mentioned a key safety factor that only patients who had had more than 12 months of natalizumab treatment were recruited:

So the two safety issues we got around is, one was allergic reaction. That's why we said patients had to have a minimum number of doses before they went on the [home] treatment, because then that risk of allergic reactions were a lot, lot less. (R2)

The main concern about transitioning treatment to the home was the management of an anaphylactic reaction in a home setting, as the following participant mentioned:

The only concern I had is that if a patient had a major anaphylactic reaction, what was the process that was involved? How was that going to be attended? That was my probably single most concern with the home infusions. (R1)

The smoothness of the process of providing natalizumab treatment at home was an important part of the experiences of the HIT. The HIT clearly prioritised the patients' perspective, especially the benefits for them of well-organised care. Participants stated that they felt more confident and organised as the process developed smoothly:

But I think from the second time I sort [of] became a little bit more – I would get there a little bit early, I felt that my preparation was – making them feel comfortable and not being rushed or on a set timeline. I think I just became a little bit more organised and relaxed in the process. After that I think everything became quite – everything was very smooth sailing. (H1)

As a nurse operating with what we, I have put in place, not any issues at all. It was ... smooth ... So I just thought no, it was good. (H3)

Subtheme two: Extra work in facilitating the change

Workload management is an approach that is used to ensure a team functions efficiently and equitably. Some of the participants emphasised a concern that they had at the beginning of the trial process that the transition would generate extra work and may have a negative impact on the unit. However, this did not eventuate:

We had the paperwork ... so we knew that those patients had come from home and now they were doing the hospital part. (F1)

I was concerned about it because of the extra workload that it might have – you know, the impact that it might have had on our unit. (F2)

All of the participants were required to do extra work and planning to ensure that the drugs were ordered, ready to be collected and arrived at the correct day and time in the patient's home:

I think from my point of view, for ordering and things like that, it was a lot of work from our side of things, to make sure that the drug was available at the times [required]. (F3)

I was quite clear about when the couriers were coming. We knew when they were coming. We had the drug prepared. They came with containers that were temperature monitored. We signed for – we checked the patients, the dosage, the temperatures, all of that. It was really quite thoroughly done; it was very comprehensive. (F3)

Subtheme three: Ensuring the cold chain is maintained

All of the HIT participants voiced the importance of maintaining the cold-chain process, mainly when handling the natalizumab between the hospital (where it was dispensed) and the home. The use of a 'cool pack' was critical (particularly in the Australian summer when the environment is very hot) in maintaining the appropriate temperature while the natalizumab was in transit:

Sometimes we did, now it may be that the nurse had scheduled an infusion for 7:00 in the morning, in which case the courier would pick up the drug from the hospital the afternoon before that, put it in the cold-chain data log and deliver it to the nurse's home [for appropriate ongoing storage]. (H4)

I really liked the flexibility of it and the fact that I guess the cool pack maintained that process. There were a couple of times when the cool pack would be delivered to my house, so I would actually have the infusion maybe hours in advance, but again I knew that we could still

check the temperature control and it was still within its manufacturing guidelines so I was happy to do that. (H1)

Monitoring the temperature within the cool pack provided confidence that the cold chain had not been broken:

What did work really well was the cold-chain hardware and we were able to prove that by monitoring not only the in-chain stuff but also the longevity of the efficacy, of the cold-chain equipment, which worked really well even over two to three days in some cases. (H4)

During the six-month home infusion trial, a participant reported that only one drug dosage was returned to the hospital, because of the patient's need to change an appointment for another week:

But if it was going to be like a reschedule of a week or more with once [only] I think we returned the drug to the hospital. So the beauty of that system is that we understood, if you like, the medication issues and the cold-chain physics well enough to make those decisions appropriately. (H4)

This analysis highlights participants' high level of awareness of a key logistical part of the process, namely maintaining the cold chain when delivering this service in the community. This demonstrates that there can be flexibility while maintaining the relevant standard to ensure that the 'cold chain' is maintained for the medication.

Theme two: Focussing on the patient

The focus on delivering a flexible, smooth process to achieve optimum patient-centred care was a pervasive theme amongst the participants. A focus on patient-centred care was the key philosophy that was adhered to by all of the participants. This theme has a sub-theme: 'convenience for the patient'.

Subtheme one: Convenience for the patient

Participants discussed how having natalizumab infusions at home provided convenience for the patients:

All of them want to know when it's going to happen permanently. I can't think of one person who didn't take part in the trial who would prefer to come into hospital. It is just so much more convenient for them. They all sort of said, look, I think this was fantastic. (R2)

Everybody really liked it. I think the bulk of the people appreciated the opportunity to have it at home, certainly if you've got young children, all that sort of thing. (F3)

In some case infusions at home improved patients' treatment compliance:

I could see the benefits, no problems at all. Having the infusion at home, I could see there would be better compliance. (R1)

The participants emphasised that having natalizumab home infusions would free up spaces for other patients currently waiting for treatment in the hospital unit:

We would free up a lot of chairs that – when we try and get patients in, it can be very difficult. So you have temporarily given some capacity in the bookings. (R1)

So, we're growing. We grow about 6 per cent a year, is what I worked out some years ago. So, we're not going to get quieter. If there is a small population that we can move to community, and it's a move that's happening nationally as well as internationally. (F3)

On the other hand, some participants noted that for some patients it was more convenient to have the infusion at the hospital:

The negatives tended to be that if that person worked in town, then it might be more convenient for them just to drop into the hospital than to have it in their work, or to go back home. (R1)

All of the HIT interviewees described their approach as 'very flexible' in providing natalizumab treatment at the patient's home, as these participants highlighted:

Yeah, look, I was very flexible. I guess it was always about the – client centred and the fact that we had post-op care in the home, that we had the ability to really deliver the infusions on a much more flexible

basis ... I delivered infusions on public holidays, weekends, I did some infusions as late as seven o'clock, seven or eight o'clock at night. (H1)

Flexible delivery of the nursing service was driven by the importance participants placed on their patients' ability to maintain their lifestyle while living with a chronic illness:

Just that it fits into their lifestyle and their – because people have busy lives these days so it's giving them that opportunity to have it done at night if they want to ... So it was just – it just made it a lot less complicated for the patient. (H2)

Theme three: Enhancing professional support and relationships

The enhancing professional support and relationships theme included all participants' experiences across both the hospital and the HIT working together throughout the project. Professional support included training, establishing clear protocols, ensuring the availability of 'back-up' if needed and support from all colleagues. Three subthemes emerged: training, positive collegial relationships and nurse–patient relationships.

Subtheme one: Training

The HIT nurses were required to attend training to ensure that they had the knowledge and skill to carry out the treatment competently in a home setting. This included considering the context in which they would practise, as one participant stated:

I think at the initial orientation with ... I think she talked a lot about risk assessment. She has done a lot of work with hospital at home and infusions in people's homes. I really asked a lot of questions and picked her brains on safety because I guess that is one of the things, we do have to be safe in a home when delivering care, another person's safety has to be paramount. (H1)

The participants also appreciated the importance of observing how the nursing staff delivered the treatment in the hospital's outpatient department, which was a requirement for HIT nurses and helped to replicate hospital care in the home environment:

What you do here is done there. It's that reassurance. (F1)

We had TAPP [Tysabri® Australasian Prescribing Program] training. So we were fully aware ... to sort of see how the infusion went and what you could do when you're actually meeting the patients. So part of that meet and greet was also looking at how ... to do the infusions. (H3)

Subtheme two: Positive collegial relationships

For the HIT participants to deliver optimal care and maximise the advantages of home infusions, it was important for a collaborative relationship to be developed and maintained across both services. The participants appreciated the professional support from others, such as team members being flexible and working together:

That was all negotiable and because we were keen to get the process or the protocols working smoothly, we were always pleased to renegotiate timing and what have you. (H4)

You just needed to be flexible and work with each other. Which we all did as nurses. (H3)

Some participants mentioned having a 'back-up' if they were not able to meet the scheduled appointment time with the patient:

I wanted compliance to treatment to be seen as not driven by the nurse. More driven by the patient. Therefore, if there was a patient that needed cannulating and be given an infusion, because the other nurse couldn't get there, I stepped in. (H3)

Senior hospital staff were also part of the collegial team and they were approached for support and advice, as this participant mentioned:

But yeah, so I would use ... staff in [hospital] senior staff. We would talk things out. If there was some issues there, we would talk it out and we would get a resolution. (H3)

An HIT participant acknowledged their responsibility as part of the team to ensure that the system worked:

From that schedule I would make it my duty, if you like, to collect the drug at an appropriate time so it could be delivered directly to the nurse in the field at the appropriate time. (H4)

The ability to deliver a good outcome for the patient was at the heart of the willingness of all the participants to be flexible in when, where and how care was provided. As a team they worked together to ensure that the patients' needs were central to the service being delivered. The patients were also part of the team so the participants delivering care in the home were also adaptable to the varying home environments while ensuring that standards of care were maintained.

Subtheme three: Nurse–patient relationships

Some participants emphasised that establishing a therapeutic relationship with the patient is necessary not only to resolve any difficulties during the treatment but also to make the patients feel comfortable and safe in the care of the visiting nurse. Meeting patients in the hospital setting before they transitioned to home care was important to promote this relationship:

It was really good to develop those personal therapeutic relationships. I think it was great for them because, they'd met me before, but then they'd also continue that follow-up care, so they felt quite safe as well. (H1)

Participants identified that family support was particularly important, not only in their presence but also as a part of the patient's wellbeing, and it contributed to the therapeutic relationship:

Also a few of them had their families around while we were doing the infusion, so I'd include them in conversations. That I think helped the patients relax a bit more, knowing that we weren't sort of dismissive

of the family. It was a very inclusive kind of process because the family are a big support to the patient, so they need to be, the family need the support as well. (H2)

Discussion

This exploratory descriptive study recognised the importance of understanding HCWs' experiences of transitioning to a patient-centred model of care, from hospital to home infusions of natalizumab. This included their perspectives on the logistics of the process and their need for training and support.

Managing the logistics to ensure a flexible, smooth process

The findings indicated that providing care at the patients' own home supported the principle of patient-centred care due to the flexibility and the convenience provided to patients. Offering infusion therapy within a non-hospital environment is common practice.²² Organising and managing home infusions requires not only skill in delivering the treatment but also in the logistics of maintaining the cold chain, particularly when the outside environment may be very hot.²³ In this study, managing the logistics appropriately was critical to the success of the home-based infusion therapy and the administration of the medication. The importance of maintaining the safety of the medication and getting it to the patient at the right time and place was emphasised by all the participants during the interviews. This required everyone to step-up and be accountable for their part in the process and to communicate well with each other.

Training and professional support

Transitioning from hospital to home services requires highly skilled home care clinicians. The participants in this study recognised that training and professional support are essential when delivering infusions outside a hospital setting. The quality of the training and professional support of the HIT affected participants' experiences of delivering infusions in the home setting. In addition, this study revealed that the training and education allowed them to fulfil their role safely, efficiently and with

confidence. Depledge and Gracie emphasised that skill-based training with continuing education is important to ensure safe treatment is delivered in a non-hospital setting such as a home infusion service.²⁴ Consistent with findings from their semi-structured study, interviews with nurses delivering home infusions in the United Kingdom found that most participants benefitted from the training and education provided, indicating that they felt confident and valued the professional support.¹⁸

Moving care from the hospital setting to the home setting requires consistent support, including enabling the HIT to access the required training and to receive ongoing advice from the hospital staff who have the experience and know the patients well. However, an international report argued that there is limited professional support for clinicians delivering home infusions due to a lack of resources.²² Alexander et al. stressed the importance of professional support in ensuring quality of care when delivering a home-based model of care.⁷ Throughout this study, professional and inter-organisation support were available to the HIT. This involvement provided very valuable support to the HIT and enhanced the sense of trust and confidence amongst the HIT team and between the HIT and hospital teams.

Managing the change from hospital to home care required good collaboration between team. This effective collaboration was vital so that the team could determine the logistics of the process of transferring patients who were medically stable to home care, how information was communicated across both teams ensuring an audit trail of documentation, and then the process of delivering the medication to the patient at the time and venue that the patient requested. Even though there was some anxiety at the start of the transition, by working together through the concerns raised, all participants felt that the patients' safety was ensured, as much as possible. The participants recognised the value of the new service delivery model; though it was potentially disruptive to the daily routine in the hospital, it would provide a better quality of life for their patients with a long-term chronic disease. It was this central value, articulated by all participants, that ensured the new model was about the patient and not about the hospital routine. If this value had not been shared across all service teams then there would have been many opportunities for the process to be sabotaged and the pilot project to fail. The results support the home model of care because of the benefits to the patients, including convenience, and importantly improving patient

compliance with their treatment.¹¹ In addition, the hospital was able to reduce the waiting list for those needing to commence treatment and to provide a more targeted service to those who were more acutely ill.

Limitations

One of the limitations of this study was the relatively small size of the HIT, which comprised only three nurses and two couriers. Another is that some of the participants were members of the main study's organising team. Although there is a positive perception of home infusions from this six-month study, a longer study period, such as a year of home infusions may present issues of sustainability, which indicates that further longitudinal studies are warranted.

Conclusions

This study provides an example of how two teams of health workers can come together to work through some difficult logistics of service delivery to establish a better way of delivering care that truly puts the patient at the centre. The new model focussed on more than the discharge of patients from one service to another, rather reflecting a model of care where patients with a chronic illness transition between home and hospital services depending on their wellbeing and the level of medical care required. Although HCWs had to accommodate extra work, especially with planning, patient assessment, nursing handovers, checking of natalizumab and documentation, they felt reassured that people with RRMS will receive a safe natalizumab infusion in an in-home setting.

Implications for research, policy, and practice

This study can inform healthcare teams about the key logistical components that are important for healthcare services, when considering transitioning to a home-based model of care for treating people with relapsing-remitting multiple sclerosis.

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Chapter Six: Discussion and conclusion

This final chapter discusses and summarises the results of this study. It starts by restating the aims and the objectives and provides a summary of the key findings. The chapter then explores the key findings from people with MS and healthcare workers' experiences of infusions at home. The study limitations are then explained, along with the implications of the study.

Restatement of the aims and objectives

Currently, people with RRMS in South Australia receive intravenous natalizumab infusions only through OITS, which is becoming a widespread alternative to inpatient treatment. Offering a home therapy service as an alternative model of care for this group of individuals may bring benefits but also may create challenges in meeting patients' needs. As mentioned earlier in this thesis, the aim of this study was to inform the development of models of care that enable a patient-centred care approach for those who require long-term care. The objectives were to:

- Explore patients' experiences of natalizumab treatment provided in the home.
- Explore healthcare workers' experiences of changing models of care from OITS to transitioning natalizumab infusions in a home environment.

Summary of key findings and discussion

The findings of this research thesis are presented in two related papers, Chapters Four and Five. Article one (Chapter Four) sets out the experiences of people with MS having natalizumab infusions at home. A major theme of 'patient-centredness' was developed from three categories: 'in the comfort of their own home', 'convenience for patients and their families' and 'saving time and money'. This is supported by international studies, which found that, because of the initial impression of comfort, the majority of participants who were given a choice elected to change to in-home infusions (Beijer et al. 2008; Milligan et al. 2006; Stephens 2013). The majority of participants in the home setting spoke about the 'comfort' of the home treatment models. The next highlighted category was 'convenience' for people with MS, with less stress at work or home events, which is very important not only for patients but also for their significant others. People with MS specified that providing in-home treatment reduced stress. This reflected the findings of Brown et al.'s (2006) study, which found that people with MS who reported acute stressors experienced a greater relapse frequency. These particular

findings have significant implications for the health and clinical management of chronic disease patients, such as those with MS.

Article two (Chapter Five) is a submitted manuscript of healthcare workers' experience of delivering a patient-centred model of care as they change from hospital to home infusion of natalizumab. Three themes were identified: 'preparing for change', 'focussing on the patient', and 'professional support'. Healthcare workers were at ease with the process of delivering natalizumab infusion in patients' own home; it was perceived as well-documented, comprehensive and adhering to the cold-chain process. Their focus has expanded not only to maintaining quality of care but also to providing support and optimal care for both patients and their family. In addition, they recognised that training and professional support need to be incorporated into the home-based model of care. The study provided further confirmation of existing literature that found that training and education support is vital to successful and effective delivery of a home-based model of care (Depledge & Gracie 2006; Turner & Pateman 2000).

This thesis has provided an understanding of what it is like to receive and administer infusions in a home environment. From the point of view of people with MS, they appreciated and benefited from the home infusion provided. This model of care also has benefits for the patients' family and friends because it reduces the burden on them to make transport arrangements. The majority of people with MS found that flexibility in negotiating their treatment played a role in enabling them to plan their daily activities as they wanted to, rather than have to work around a trip to a hospital. The staff had a major focus on delivering a flexible and well-managed process that enabled a home-based model of care. The management of the logistics of keeping the cold chain intact and delivering the infusion safely required good communication and follow through on designated tasks by all staff across hospital and home. It would only take one breakdown in this process to cause a major issue particularly for the home care staff. The logistics component is central to the experience of healthcare workers, as it encompasses support for most aspects of patient care. Both patients and healthcare workers greatly valued the flexibility of delivering natalizumab in-home. This home-based model of care is of particular relevance to infusion therapy involving lifelong treatment. The findings from this study may also be used in community education, home infusion therapy and supervision for students in the healthcare field.

The involvement of healthcare workers is an important component in delivering a change in service delivery models, because their engagement in the process may influence the patients' experience of receiving infusions in their own home. During the six-month trial, the home infusion team were very accommodating about infusion appointments. Patients were allowed to have their natalizumab infusions after work hours, or on weekends and public holidays. In addition, the team was also flexible about the infusion settings, and one patient was treated at their workplace. Although the trial provided flexibility especially with appointment times, this might be challenging to sustain when upscaling to a bigger patient cohort and long-term delivery of infusions. For example, providing infusions after hours and on public holidays may pose additional costs for the institution which must pay the healthcare workers. Another challenge is planning healthcare workers' catchment area, as some MS patients might live far from the work site, causing too much travel time.

Significance and recommendations

This study complements the larger study (Appendix 1) in understanding that this is an acceptable model of care for the patients and that, with a collaborative, coordinated approach by staff in the hospital at home service, it could be undertaken safely. Using the HITH model to offer people with MS natalizumab infusions in the home is a step towards hospital services adapting their care delivery more towards meeting patients' needs rather than the convenience of the health service staff. No previous qualitative research has focused on patients' experiences of receiving infusions at home.

It is recommended that the results of this study are used to inform healthcare teams, management and policy makers to seriously consider alterations to the models of care for treating RRMS patients. The next section will discuss the limitations of the study.

Research limitations

The limitations of a study must be taken into consideration when analysing the findings. The following are the limitations of this study:

- The participants in this study consisted of people with MS who were currently receiving infusions at a single, metropolitan, tertiary hospital. The outcome may not be generalisable to other groups of patients and other people with MS at other hospitals.
- The interviews were conducted once during the patients' monthly infusion in the hospital setting after they crossed over from home care. There may be some limitations due to the time spent on the interview and interruptions, such as infusion pump alarms, that needed nurses' attention.

- Although there is a positive perception of home infusions, longer durations of home infusions may alter the findings, which indicates that further longitudinal studies are warranted.

Conclusion

This component of a large study has exposed patients' preferences for home infusion therapy. First, the participants revealed that in-home infusion therapy was pleasant, stress free and provided comfort within a familiar environment. They identified that these positive experiences provided them greater convenience and control over their work and home activities, and most importantly reduced the additional fatigue they felt when they had to manage travel to and from the health service and the time spent in treatment in a busy hospital environment. In addition, they appreciated the flexibility of managing appointments with the in-home infusion team, which benefited their family and themselves. Overall, the findings offered support for the delivery of safe infusion therapy in the home. This study has demonstrated that, with a carefully considered clinical process, patient-centred care can become a reality for patients with MS. It does require healthcare staff to be supported in changing the way they work, but if they truly believe in their patients being at the centre of the care, are in the environment they want to be in, then change must occur.

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Appendices

Appendix 1: Developing a model of care for home infusions of natalizumab for people with MS

Statement of Authorship

Title of Paper	Developing a Model of Care for Home Infusions of Natalizumab for People With Multiple Sclerosis
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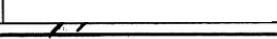
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- i. the candidate's stated contribution to the publication is accurate (as detailed above);
- ii. permission is granted for the candidate to include the publication in the thesis; and
- iii. the sum of all co-author contributions is equal to 100% less the candidate's stated contribution.

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Developing a Model of Care for Home Infusions of Natalizumab for People With Multiple Sclerosis

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ABSTRACT

Natalizumab is an effective treatment for multiple sclerosis that requires 4-weekly infusions that are usually provided in hospital outpatient clinics. In this study, a model of care (MOC), an overarching design for the provision of a health care service, was developed to permit home infusions of natalizumab. The proposed new MOC comprised 9 dimensions, in addition to the central concept of patient-centered care at home. The new MOC is responsive to patient needs and prioritizes the nurse–patient therapeutic relationship. It provides practical examples of patient-centered care to guide clinical practice for this patient population in the home setting.

Key words: home care, home infusion therapy, model of care, multiple sclerosis, natalizumab, patient-centered care

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neurological diseases. She is the head of the medical excellence and operation team in Japan, leading data generation, medical operations, field medical excellence, and patient services functions. **Kevin Webb, BNurs, RN,** is a neurology nurse consultant at Royal Adelaide Hospital and the Queen Elizabeth Hospital. **Jonathan Karnon, PhD, MSc,** is a health economist at Flinders University. His main area of research is the use of economic evaluation to inform health service decision-making. Dr Karnon has developed and applied methods for the economic evaluations of health care technologies and services in Australia and the United Kingdom. **Janakan Ravindran, MBBS,** is a consultant neurologist at the Royal Adelaide and Lyell McEwin hospitals. He is currently the clinical lead for neuroimmunology at the Royal Adelaide Hospital and has particular subspecialty interests in multiple sclerosis and other neuroimmunological conditions, as well as peripheral neuromuscular disorders.

All authors participated in the meetings to develop the model of care. Dr Schultz led the literature review work. Ms Thomas led the development of home infusion processes. Mr Georgiou, Ms Simon, Ms Juaton, Mr Webb, and Dr Ravindran provided feedback on hospital infusion processes. Dr Cusack provided input into nursing workforce requirements and Prof Karnon provided input on health economics. Dr Schultz drafted the first version of the manuscript; all authors read and approved the final manuscript.

Consent for publication for this article is not applicable. Data sharing is not applicable to this article, as no data sets were generated or analyzed during the current study. The research was funded by Biogen Australia and New Zealand as investigator-initiated research.

Ms Thomas is director of Post-Op Care at Home (Pty Ltd). This organization was subcontracted to deliver the home care nursing. Therefore, if the outcome of the project is positive and home delivery of natalizumab becomes a new model of care, this could lead to commercial gain for Ms Thomas.

Ms Naidoo is an employee of Biogen, manufacturer of natalizumab. Therefore, if the outcome of the project is positive and home delivery of natalizumab becomes a new model of care, this could lead to commercial gain for Biogen if it leads to more patients receiving natalizumab than would otherwise have been the case.

Dr Ravindran received travel support funding for conference attendance from Biogen.

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Multiple sclerosis (MS) is a chronic autoimmune disorder causing inflammation, demyelination, and degeneration of the central nervous system and affecting some 2 million people worldwide.¹ Natalizumab is a disease-modifying therapy that reduces the relapse rate, number of lesions, and progression of disability for people with relapsing-remitting MS.² A monoclonal antibody, natalizumab is delivered as a 1-hour intravenous (IV) infusion of 300 mg every 28 days.³ It is generally well tolerated by patients through peripheral IV administration, although adverse drug events include hypersensitivity reactions (eg, anaphylaxis), infections (eg, urinary tract infection), and less serious infusion-related reactions occurring during or up to 1 hour after the infusion (eg, fatigue and headache).⁴ Acute hypersensitivity reactions (eg, urticaria) occur in 3% to 4% of patients, with serious hypersensitivity anaphylaxis reactions occurring in 1% of patients.^{2,5} Infusion-related reactions are typically nonspecific and, in addition to fatigue and nausea, may also include weakness, dizziness, sweating, fever, rash, rigors, diaphoresis, slow pulse, and/or a moderate drop in blood pressure, dyspnea, chest pain, and leg bruising.^{3,6,7}

The safety of natalizumab in the long term is consistent with shorter-use safety profiles.^{8,9} For long-term use the most significant safety concern with natalizumab is progressive multifocal leukoencephalopathy (PML). PML is an opportunistic central nervous system infection that has been associated with John Cunningham virus.¹⁰ First identified in 2005,^{11,12} the incidence of PML in patients who had received natalizumab is 4.2 cases per 1000.^{12,13} Anti-John Cunningham virus antibody index testing, regular magnetic resonance imaging monitoring, and testing for clinical manifestations are recommended to reduce the risk of PML from natalizumab.^{10,12,14}

Natalizumab infusions are conventionally delivered in hospitals, physicians' offices, MS clinics with infusion centers, and free-standing infusion centers with physician supervision.¹⁵ In South Australia, patients receive natalizumab infusions in hospital-based outpatient clinics.¹⁶ However, for people with chronic disease, home care can lead to better outcomes through avoidance of travel times and out-of-pocket expenses.^{17,18} This reflects a growing trend worldwide toward delivery of health care in the home rather than hospital.^{19,20}

Home care is defined as "the care provided by professionals to people in their own homes with the ultimate goal of not only contributing to their life quality and functional

health status, but also to replace hospital care with care in the home for societal reasons."^{21(p861)} In parallel to the broader provision of health care at home, home infusion therapy is the administration of medications using IV, subcutaneous, and/or epidural routes in the home setting.²² Beginning with home parenteral nutrition in the late 1970s²³ and home IV immunoglobulin therapy,²⁴ the move to home infusions has extended into a range of diseases and treatments. For example, home-based chemotherapy has recently been shown to be feasible, safe, and valued as an alternative to treatment at an outpatient clinic.²⁵

There has been little progress in delivering monoclonal antibody treatments at home, although home infusions of infliximab for people with Crohn's disease was trialed for 29 adults in the Netherlands²⁶ and 10 children in the United States.²⁷ Similarly, the first at-home natalizumab infusion service in which 34 patients received nearly 500 doses in total at home was recently described in a conference abstract.²⁸ No specific details were published about the protocol for home infusions or how it was developed and approved.

Providing patients with choice and flexibility about where they are able to receive their treatment and who can provide it is a central tenet of patient-centered care.^{29,30} To support the provision of patient-centered care and provide home care as a safe option to people with MS, it is necessary to develop a new model of care. A *model of care* is defined as "an overarching design for the provision of a particular type of health care service that is shaped by a theoretical basis, evidence-based practice and defined standards."^{31(p47)} The aim of this study was to develop a patient-centered MOC for home infusions of natalizumab for people with MS.

METHODS

The concept of home infusion therapy was applied to people receiving natalizumab for MS. The research team drew on extant literature and evidence-based practice, clinical and research experience, and existing standards and policies to develop a patient-centered MOC.

Definitions and Framework for the New MOC

To guide the new MOC, the Institute of Medicine's definition of patient-centered care was used: "Providing care that is respectful of, and responsive to, individual patient

preferences, needs and values, and ensuring that patient values guide all clinical decisions.^{30(p6)} This definition provided the foundation for many of the dimensions of the MOC, which naturally placed patients at its center and incorporated 8 key components of patient-centered care: (1) respect for patients' preferences and values, (2) emotional support, (3) physical comfort, (4) information, communication, and education, (5) continuity and transition, (6) coordination of care, (7) the involvement of family and friends, and (8) access to care.²⁹

This study was guided by the United Kingdom Medical Research Council framework for developing and evaluating complex interventions.³² A search for relevant evidence ("preclinical or theoretical phase") was first conducted in March 2016 and updated in June 2018. PubMed, Scopus, Cochrane Library, Joanna Briggs Institute, and Cumulative Index to Nursing and Allied Health Literature databases were searched using search terms and medical subject headings including "home infusion"; "home care"; "natalizumab"; "monoclonal antibody"; "adverse events"; "IV infusion"; "multiple sclerosis"; and "home care services." The search identified 35 published studies relevant to the aims of this study, including studies in 5 main topics: safety and adverse effects of natalizumab,^{2,4-13} home care,^{19-22,33-36} home infusions,^{18,24-28,37-41} infusion guidelines and standards,^{15,42} and medication management.⁴³ In addition to relevant published studies, product information,³ training guides,⁴⁴ Australian health care standards,⁴⁵ and organizational protocols¹⁶ were included, and US infusion therapy standards⁴⁶ were reviewed for applicability in the Australian setting. Critical appraisal of studies was not conducted.

Key findings from the included studies were extracted and discussed during regular (4–6 weekly) research team meetings in 2016–2017. The discussions focused on the 5 main topic areas and involved all members of the research team, representing home care nursing, nurse education and regulation, day unit clinicians, health policy and economics, neurology, pharmaceutical industry, evidence synthesis, and patient safety research. In phase 1 modeling, which involved modeling to improve understanding of the components of an intervention,³² the components of the MOC to safely deliver home infusions of natalizumab were developed inductively from the literature and research discussions. Decisions were made by consensus during meetings, and draft minutes were circulated for discussion and confirmation at subsequent meetings.

The resulting MOC was to be used to design a phase 2 exploratory trial,³² testing the feasibility of delivering home infusions and providing preliminary data about safety and effectiveness.⁴⁷ As the MOC was designed to be formally evaluated, it included components related to data collection and documentation of adverse events.

Setting

The study was set in Adelaide, South Australia, as a collaboration among a university, a major public metropolitan

acute care hospital, a private provider of home nursing, and a pharmaceutical company. Meetings occurred at the day-infusion service within the hospital outpatient area. The MOC was intended to replicate care provided in the day-infusion service; therefore, other hospital medical and nursing staff were also consulted, and the perspectives of patients with MS were gained opportunistically by staff delivering infusions in the hospital clinic.

Ethics

As the development of the model of care involved review of literature, policy and current practice, and discussions by researchers, formal ethical approval was not required for phase 1 modeling. The phase 2 study protocol, based on the MOC developed here, was subsequently reviewed and approved by the Royal Adelaide Hospital Human Research Ethics Committee (HREC/16/RAH/192).

RESULTS

The new MOC developed for home infusions of natalizumab is summarized in Figure 1. The MOC was composed of 9 dimensions, in addition to the central concept of patient-centered care at home for people with MS. Each dimension is described in more detail in the Figure.

Home Nursing Care Provider

The hospital does not provide a home nursing service; therefore, a private provider of home nursing care (Post-Op Care at Home Pty Ltd [POCaH]⁴⁸) was contracted to deliver the home infusions. Three registered nurses, each with more than 10 years of experience, were employed to deliver infusions. Appropriate insurance coverage (ie, professional indemnity, public liability, and work injury) was in place. Equipment used by the home nursing provider included an infusion stand, consumables, and vital signs monitoring (temperature, blood pressure, and respiration). The home care provider was represented on the research team and led much of the developmental work required to operationalize the model of care. The hospital lacked funding for home nursing; therefore, the home nursing care and consumables were funded by Biogen Australia and New Zealand, manufacturers of natalizumab.

Competency of Nurses

Clinical competency is essential to maintaining patient safety; for infusion nursing, such competencies include clinical management of special populations, anatomy and physiology, safety considerations, vascular access device planning, and management and infusion administration.⁴⁶ Sound patient assessment, documentation, and patient education skills are essential for home infusion nursing as well.³⁷

The registered nurses delivering home care were required to undertake the following: (1) a half-day orientation to home infusions, (2) a full-day orientation to POCaH,

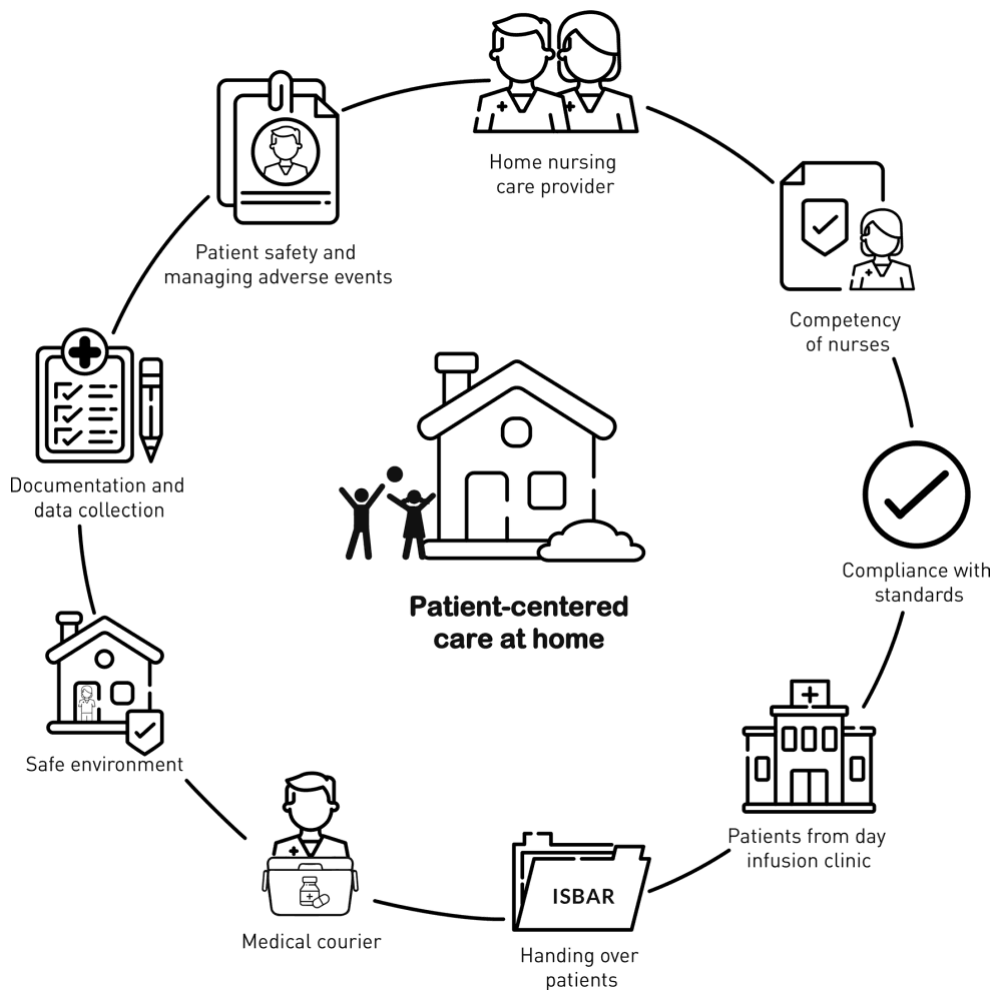


Figure 1 The new model of care developed for home infusions of natalizumab. Abbreviation: ISBAR, Identify, Situation, Background, Assessment, and Recommendation. © Timothy Schultz.

and (3) a 2-hour online training about prescribing and delivering natalizumab.⁴⁴ In addition, nurses undertook a half-day placement in the hospital clinic to familiarize themselves with the clinic's processes and to provide similar care to the infusion clinics. Because some patients experience difficulty with IV access,^{7,27} a refresher course in cannulation was also undertaken to ensure currency of practice.

Compliance With Standards

The 2011 National Safety and Quality Health Service Standards cover high-prevalence adverse events, such as health care-associated infections, medication safety, and clinical communication.⁴⁵ The National Safety and Quality Health Service Standards and the Infusion Nurses Society's 2016 *Infusion Therapy Standards of Practice*⁴⁶ were used to inform the development of the POCaH Safe Quality Health Service Manual. Some of the practices built into the model

of care that were derived from these standards include the following:

1. Patient identification: patient name, birth date, and address were used as the 3 identifiers required for treatment to proceed;
2. Signed consent from the patient and the physician to proceed with home treatment; and
3. Signed treatment order from the physician used to clarify the 9 steps for accurate medication delivery.

Patients From the Day Infusion Clinic

As some patients had been receiving natalizumab infusions at the hospital clinic for ≥ 5 years, strong therapeutic relationships between clinic staff and patients were noted. The involvement of patients and clinic staff, as well as the MS clinical nurse specialist, in the development of the MOC

helped to manage existing therapeutic relationships in the clinic. Ensuring that the patients' neurologist approved their participation in the trial was another strategy to manage this challenge. As part of the consent process, patients were also clearly informed that, after the conclusion of the research, their usual care would revert back to the clinic.

Handing Over Patients

Ensuring continuity is an essential nursing factor for home infusions.³⁷ Home infusion nurses met the project participants in the clinic before their first home infusion, facilitating patient preferences (eg, preferred vein for cannulation, timing, and location of the next infusion), sharing of contact details, and initiation of a nurse–patient therapeutic relationship. Patients were encouraged to contact nurses directly for any scheduling changes.

To facilitate consistency in the handover of patients between the public (clinic) and private (POCaH) settings, the Identify, Situation, Background, Assessment, and Recommendation (ISBAR) handover tool (as used in the public setting) was also adopted. The ISBAR mnemonic improves safety in the transfer of critical information and facilitates effective communication.^{34,49} A handover form was developed to assist in the transfer of patients into POCaH care. This form captured patient contact details, general practitioner details, other medications, allergies, pain management, and signatures of the neurologist and patient.

Medical Courier

Natalizumab is provided in single-use 15-mL vials, which, like most pharmaceuticals, must be at 2°C to 8°C (36°F–46°F).⁴³ Vials should also be protected from light and not shaken or frozen.³ Given these restrictions and air temperatures that readily exceed 40°C in the Australian summer, medical couriers were employed to transport the medication. Additionally, couriers were on hand to assist in the evaluation of the safety of the environment for the nurse and to intervene if required.

To ensure compliance with “cold chain” handling requirements, medical couriers used a Coolpac 15 Pre-Qualified Insulated Shipper (Coolpac; Doveton, Victoria, Australia). These are certified to maintain 2°C to 8°C for up to 72 hours in a Mediterranean summer and were piloted for use in an Australian context. As an additional safety measure, a temperature logger (LogTag; Northcote, Auckland, New Zealand), accurate to 0.5°C, was included with the natalizumab in the Coolpac Shipper. The temperature logger was set to visually alert if the 8°C threshold was crossed, and data for each infusion were recorded. Data about each natalizumab transfer (eg, date, time, location, patient details, and temperature) were recorded on a data collection document.

Safe Environment

Hazards in the home environment include bloodborne pathogen exposures, demanding patient mobilization and

transfer tasks, threat of violence and other personal safety issues, and the presence of pets.³⁹ The importance of a safe environment for both home care nurses and patients^{28,37} was addressed in POCaH orientation, including strategies for improving safety in home care and use of an environment checklist. The checklist included items relating to parking, patient's health status, presence of family members, cleanliness and suitability of the environment, and other issues, such as the presence of pets.

Documentation and Data Collection

Effective documentation of care is essential within health care,⁴⁵ and the home infusion environment specifically.^{37,42} Data from each home infusion were recorded to provide a record of home care to add to the clinic's patient records and to collect data as part of the phase 2 trial. A “Clinical Pathway and Report” form was developed. This form captured patient and infusion details, including the method of delivery (eg, port and IV cannula); the presence of any infections, treatments, and outcomes; details about the expiration date and batch numbers; any comments about environmental safety; and observations (eg, temperature, pulse, respiratory rate, or blood pressure) measured before, during, and after the infusion.

Patient Safety and Managing Adverse Events

The author team developed eligibility guidelines for patients to minimize the likelihood of a hypersensitivity reaction. As most hypersensitivity reactions typically occur by the second ever infusion,² as a conservative measure, only patients with a minimum of 6 previous natalizumab infusions were eligible for the new MOC.

In addition to minimizing the likelihood of a hypersensitivity reaction, the new model of care included clear guidelines for managing adverse events and serious adverse events. A total of 9 documents were developed, including a flow chart of actions, definitions, and reporting requirements. In the event of an adverse event, home care nurses were instructed to stop the infusion, apply first aid, and contact the hospital's on-call neurologist. For serious adverse events causing severe discomfort and risk of serious injury or death (eg, anaphylaxis), nurses were instructed to contact an ambulance for immediate medical help. As per usual clinic-based care, a preinfusion questionnaire was administered before all home infusions. Vital signs were measured for 20 minutes postinfusion, with an additional 20 to 40 minutes if required until the patient was stable.

DISCUSSION

This study led to the development of a new MOC for delivering natalizumab infusions in patient's homes. The MOC can be used as a protocol to manage the hand over of patients between hospital and home, transport of medication to patients' homes, the delivery of home infusions, treatment

of any adverse events, and training of home care nurses. The new MOC is responsive to patients' needs and prioritizes the nurse–patient therapeutic relationship through mutual respect, acknowledgment of autonomy, and sharing goals.⁵⁰ The MOC helps to meet Multiple Sclerosis Australia's position statement on Health and Community Services: "People with MS should have access to a range of coordinated and integrated health and community care services, in line with their needs."^{51(p1)}

The proposed new MOC has 9 dimensions in addition to a central component of patient-centered care at home. Most of these map to the 4 key areas identified as predictors of positive outcomes in infusion nursing⁴²: (1) appropriate patient selection: patient safety and managing adverse events; (2) effective patient education: handing over patients; (3) meticulous patient care and comprehensive assessment and monitoring: home nursing providers, competency of nurses, compliance with standards, and documentation and data collection; and (4) interprofessional communication and collaboration: patients from the hospital clinic and medical courier. The one other dimension of the MOC is safe environment, which seeks to manage risks from the home environment to both staff and patients.

The planning for the new MOC has ensured that the preconditions for implementation and evaluation are in place before the commencement of the evaluation.³¹ A recent phase 2 pilot study evaluated the safety, feasibility, acceptability, clinical effectiveness, and costs of the new MOC.⁵² Patient perspectives of the MOC have also been collected to inform its potential further development.⁵³ Future considerations of scale up and sustainability of the home infusion MOC should be informed by the phase 2 trial⁵² and future phase 3 and phase 4 studies.³² Sustainability of funding home nursing is clearly paramount to greater uptake across the Australian health system. Although cost savings are consistently reported for home infusions across a range of therapy indications,⁴⁰ operationalizing funding between different parts of the health system is likely to be challenging.

Patient Centeredness in Home Infusions

The philosophy and practice of patient-centered care should be at the core of the new model of care.⁵⁴ Patient-centered care values the needs of patients, caregivers, and staff and emphasizes the reciprocity of therapeutic relationships and responsiveness to individual patient's needs, values, and preferences.^{29,30} Respect; coordination and integration of care; information, communication, and education; physical comfort; emotional support; and involvement of family and friends are all key dimensions to patient-centered care.⁵⁵ In the new MOC for home infusions, these dimensions are apparent through the greater flexibility and patient involvement in the delivery of care and the timing and location for infusions; for example, infusions can be given after hours, in the patient's home or that of a friend or family member, or in the patient's workplace. The model of care also permits

greater flexibility in rescheduling infusions. These practical examples of patient-centered care can help to embed it into home infusion clinical practice.

Patient Safety and Quality of Care

Maintaining patient safety and preventing complications in the context of delivery of care at home are paramount.⁴² Homes lack specialized equipment available in acute care settings, and care at home may be less structured and less regulated.³³ Patient safety was addressed by restricting patient eligibility to those who had previously received at least 6 natalizumab infusions and were deemed stable by neurologists, developing clear guidance for home nurses to manage an adverse event, replicating the care provided in the clinic setting using appropriate standards of care and ensuring the competency of the home care nurses. It is expected that these measures will ensure the safety of patients with MS at home, although further evaluation of the MOC is likely to be required.⁵²

This proposed model of care reflects other home care initiatives designed to improve efficiency, patient centeredness, safety, and quality, while reducing health care costs and meeting greater demand.²¹ Treatments that have recently been shown to be safe and efficacious when delivered at home include IV antibiotics for cellulitis,⁴¹ enzyme replacement therapy for Gaucher disease⁵⁶ and Fabry disease,¹⁷ and complex chemotherapy in acute leukemia and lymphoma.³⁸ Possible benefits from home care include improved adherence to treatment, better quality of life and clinical outcomes, reduced health system costs, and greater convenience to patients.^{17,18}

LIMITATIONS

The study is limited to a single medication, although it is probable that key learnings can be adapted to other infusion medications and for other types of chronic diseases. Although the team conducted a comprehensive search for literature across multiple databases, it is possible that relevant articles were not included in our search results. Care protocols from only 1 organization were used as the basis for care in the day-infusion clinic.

CONCLUSION

The new MOC has been developed to allow people with MS to receive infusions of natalizumab at home and addresses 9 key dimensions of patient centeredness. The MOC provides practical examples of patient-centered care to guide clinical practice for this patient population in the home setting. The need to ensure patient safety in the home setting is integral to the new MOC. Additional work is required to evaluate the model of care and scale it up to ensure its utility at the health system level across multiple hospital sites.

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Appendix 2: Ethics approval



Government of South Australia
SA Health

Approval Date: 22 June 2016

Dr Janakan Ravindran
Department of Neurology
ROYAL ADELAIDE HOSPITAL

Central Adelaide Local Health Network
Royal Adelaide Hospital Human Research Ethics Committee
Level 4, Women's Health Centre
Royal Adelaide Hospital
North Terrace
Adelaide, South Australia, 5000
Telephone: +61 8 8222 4131
Email: Health.CALHNResearchEthics@sa.gov.au

Dear Dr Ravindran,

Project Title: "What is the safety and clinical effectiveness, acceptability and cost effectiveness of flexible delivery of natalizumab (Tysabri®) by ambulatory care nurses for people with multiple sclerosis?"

HREC reference number: HREC/16/RAH/192

CALHN Reference number: R20160513

Thank you for submitting the above project for ethical and scientific review. This project was first considered by the Royal Adelaide Hospital Human Research Ethics Committee at its meeting held on 26 May 2016. I am pleased to advise that your protocol has been granted full ethics approval and meets the requirements of the *National Statement on Ethical Conduct in Human Research, incorporating all updates*. The documents reviewed and approved include:

- NEAF Application: AU/1/A2E5211, dated 05 May 2016. Site covered by this approval:
 - Royal Adelaide Hospital: PI-1 – Dr Janakan Ravindran
 - PI-2 – Dr Tim Schultz
- Cover letter/investigators statement, dated 04 May 2016
- Appendix III: **Protocol**, Version 3, 21 June 2016
- Appendix VII: Information sheet, Patient, Version 2, 10 June 2016
- Appendix VIII: Draft Consent form, Patients, Version 2, 10 June 2016
- Appendix IX: Draft Consent form, Patient interview, Version 2, 10 June 2016
- Appendix X: Information sheet, Clinician, Version 2, 10 June 2016
- Appendix XI: Draft Consent form, Clinician interview, Version 2, 10 June 2016
- Appendix XII: Product Information, Tysabri, 11 January 2016
- Appendix XIV: MSQI – Multiple Sclerosis Quality of Life Inventory [MHI removed]
- Appendix XV: EDSS – Expanded Disability Status Scale, Version 1, 3 May 2016
- Appendix XVII: TSQM – the Treatment Satisfaction Questionnaire for Medication, Version 1, 3 May 2016
- Response to request for further information letter, dated 21 June 2016

HREC approval is valid for **5 years** from **22 June 2016 to 22 June 2021**.

Please quote the **HREC Reference number, HREC/16/RAH/192** and the **CALHN Reference number, R20160513** and allocated to your study on all future correspondence.

GENERAL TERMS AND CONDITIONS OF ETHICAL APPROVAL:

- For all clinical trials, the study must be registered in a publicly accessible trials registry prior to enrolment of the first participant.
- Adequate record-keeping is important. If the project involves signed consent, you should retain the completed consent forms which relate to this project and a list of all those participating in the project, to enable contact with them in the future if necessary. The duration of record retention for all clinical research data is 15 years.
- Researchers must notify the Research Ethics Committee of any events which might warrant review of the approval or which warrant new information being presented to research participants, including:
 - (a) serious or unexpected adverse events which warrant protocol change or notification to research participants,
 - (b) changes to the protocol,
 - (c) premature termination of the study
- The Committee must be notified within 72 hours of any serious adverse event occurring at each approved site.
- Confidentiality of the research subjects shall be maintained at all times as required by law.
- Approval is valid for **5 years** from the date of this letter, after which an extension must be applied for.

- Annual review reports must be submitted to the HREC, every 12 months on the anniversary of the above approval date. Each site covered by this HREC must submit a report, and it is the responsibility of the Coordinating Principal Investigator to ensure this is provided to the RAH HREC Executive Officer, within 10 working days on each anniversary of the approval date, using the Annual Review Form available at: <https://www.rahresearchfund.com.au/rah-research-institute/for-researchers/human-research-ethics/>
- The REC must be advised with a final report or in writing, and a copy of any published material, within 30 days of completion.

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qisylaeottheCALHNResearchEthics@sa.gov.au*

This Committee is constituted in accordance with the NHMRC's *National Statement on Ethical Conduct in Human Research (2007)* incorporating all updates.

Should you have any queries about the HREC's consideration of your project, please contact Mrs Heather O'Dea, Executive Officer on 08 8222 4139, or Health.CALHNResearchEthics@sa.gov.au.

The HREC wishes you every success in your research.

Yours sincerely,

**A/Prof A Thornton
CHAIRMAN
RAH HUMAN RESEARCH ETHICS COMMITTEE**



11 October 2016

Dr Janakan Ravindran
Department of Neurology
Royal Adelaide Hospital
North Terrace, Adelaide, SA 5000

Dear Dr Ravindran

HREC reference number: HREC/16/RAH/192

SSA reference number: SSA/16/RAH/284

Governance reference number: 8225

Project title: What is the safety and clinical effectiveness, acceptability and cost effectiveness of flexible delivery of natalizumab (Tysabri®) by ambulatory care nurses for people with multiple sclerosis?

RE: Site Specific Assessment Review

Thank you for submitting an application for authorisation of this project. I am pleased to inform you that authorisation has been granted for this study to commence at Royal Adelaide Hospital, SA.

The following conditions apply to the authorisation of this research project. These are additional to those conditions imposed by the Human Research Ethics Committee that granted ethical approval to this project:

1. Authorisation is limited to the site/s identified in this letter only.
2. Project authorisation is granted for the term of your project outlined in Section 9 of the SSA, or until the project is complete (whichever date is earlier).
3. The study must be conducted in accordance with the conditions of ethical approval provided by the lead HREC, SA Health policies, and in conjunction with the standards outlined in the *National Statement on Ethical Conduct in Human Research (2007)* and the *Australian Code for the Responsible Conduct of Research (2007)*.
4. Proposed amendments to the research protocol or conduct of the research which may affect the ethical acceptability of the project, and which are submitted to the HREC for review, are copied via email to this Research Governance Office;
5. Proposed amendments to the research protocol or conduct of the research which only affects the ongoing site acceptability of the project, are to be submitted via email to this Research Governance Office;
6. For all clinical trials, the study must be registered in a publicly accessible trials registry prior to enrolment of the first participant.
7. Proposed amendments to the research protocol or conduct of the research which may affect both the ongoing ethical acceptability of the project and the site acceptability of the project are to be submitted to this Research Governance Office after a HREC decision is made.
8. A copy of this letter should also be maintained on file by the Coordinating Principal Investigator as evidence of project authorisation.
9. Notification of completion of the study at this site is to be provided to this Research Governance Office.

If University personnel are involved in this project, the Principal Investigator should notify the University before commencing their research to ensure compliance with University requirements including any insurance and indemnification requirements.

We wish you every success in your research project.

Yours sincerely

Bernadette Swart
Manager, CALHN Research Office
Ph: 8222 3890
Email: bernadette.swart@sa.gov.au
Email: Health.ResearchGovernanceIP&Contracts@sa.gov.au

Appendix 3: Interview questions

Patient interview questions

1. Can you tell me about your experiences of receiving natalizumab infusions at your own home?
2. What words would you use to describe your experiences?
3. What impact did the setting for receiving infusions have on your own and your families'/partners' routine?
4. What is most important to you as a patient when receiving your infusion?
 - How does receiving treatment at home compare to receiving it at the ambulatory day care unit?
 - Do you have a preference for receiving the treatment at home or at the ambulatory day care unit? If so, can you explain why?
 - What would be your advice to others receiving treatment?

Health care workers' (Home Infusion Team) interview questions

1. Could you please share with us how you have started working with the Home Infusion Team?
 - How did you know about the project?
2. What training have you received as a preparation for this project?
 - Did you feel prepared for the project?
3. How did you feel when you learned you were going to deliver natalizumab infusions at patients' homes?
4. Reality VS expectations
 - Did you learn everything beforehand or did you have to learn on the job?
 - How would you describe the experience?
5. What do you perceive to be your main task in meeting with the patient and family?
 - What is your view of the patient and family presence in the care scenario?
 - Were there challenges?
 - How would you describe the therapeutic relationship with home care patients as part of the trial?
 - o Pre-interview
 - o During infusion
 - o Post infusion
 - Family members involvement
 - o Where the family members present?
 - o If present, what sorts of interaction did they have?
6. What does 'flexible' mean for you as a nurse, in terms of how home infusions are provided?
 - Nurses' perspective on taking patient preference into consideration
 - Also, the need to reschedule for patient's health issues
 - Exploring meeting and infusion times (nurses and patients' preference and needs)
7. Nurses' perceived need for support from the Home Infusion Team
 - In terms of safety, what support do you need when delivering natalizumab?
 - Who will you get support from?
8. Have you incurred out of pocket expenses?
 - Petrol
 - Car km
 - Car's wear and tear
 - Parking ticket
9. Patient safety
 - Adverse event
 - o What are your thoughts on the documents sent out to record side effects from infusion?
 - o Do you have any concerns about the possibility of an adverse event?