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PERIPHERAL INTRAVENOUS THERAPY: FOCUS ON ASEPSIS

Systematic literature review

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<p>Hospital-acquired infections (HAIs) present a substantial problem for healthcare providers. The aim of this final project was to improve the safety of patients and health care practitioners in Infection Disease Clinic in Helsinki University Central Hospital (HUCH). This final project was a part of improving asepsis during the preparation, administration and management of peripheral intravenous therapy, a project conducted by the Metropolia University of Applied Sciences in collaboration with Helsinki University Central Hospital.</p> <p>The purpose of the final project was to describe the principles' involved in the preparation, administration and management of peripheral intravenous therapy in the clinical setting. We conducted a systematic literature review of published studies that describe the principles of asepsis involved in the preparation, administration and management of peripheral intravenous therapy in the clinical setting from 2005 to January 2012. From a total of 1135 publications, only eight papers (0.7%) described the guidelines specific to peripheral intravenous therapy. A further 3 articles were selected from the reference list.</p> <p>We described the guidelines from the perspective on preparation, administration and management of peripheral intravenous therapy. Thematic synthesis of all text, figures, tables under the heading, key points, findings, results and discussion or conclusions reported in each included study was performed to develop descriptive and analytical themes. Eleven themes emerged. These themes were based on education of patients and health professionals, environment, hand hygiene, aseptic technique, skin preparation, Insertion of peripheral catheter, catheter-site dressing, maintaining sterile barrier, replacement of administration sets and peripheral catheters, documentation and performance improvement.</p> <p>The findings suggested that healthcare practitioners should always consider the patients as being susceptible. Standardization of practices will help reduce the risk of infection. Finally all health care practitioners must be educated to ensure that practices and procedures are adhered to and are consistent with day-to-day practices.</p>	
Keywords	peripheral intravenous therapy, asepsis, hospital acquired infection, infection control

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<p>Sairaalainfektiot (HAIs, Hospital-acquired infections) asettavat nykypäivänä uusia haasteita terveydenhuollon henkilökunnalle. Tämän opinnäytetyön tavoitteena on parantaa potilaiden ja terveydenhuollon ammattilaisten turvallisuutta HYKS:n infektiosairauksien klinikalla perifeerisen suonensisäisen neste ja lääkehoidon osalta. Opinnäytetyömme on osa Metropolia Ammattikorkeakoulun ja Helsingin yliopistollisen keskussairaalan (HYKS) yhteistyöhanketta.</p> <p>Opinnäytetyömme aiheena oli selvittää suonensisäisen lääke- ja nestehoidon toteuttamisen periaatteita aseptiikan osalta. Teimme systemaattisen kirjallisuuskatsauksen vuosina 2005 - 2012 julkaistuista IV-lääkehoidon aseptiikka käsittelevistä tutkimuksista. 1135 tutkimuksesta valikoitui kahdeksan (0.7%) tutkimuskysymykseemme vastaavaa IV-hoidon aseptiikkaa käsittelevää tutkimusta. Näiden kahdeksan tutkimuksen lisäksi olemme sisällyttäneet kirjallisuuskatsaukseen kolme tutkimusten lähdeluetteloista valikoitunutta artikkelia.</p> <p>Olemme opinnäytetyössämme kuvanneet aseptiikan periaatteita perifeerisen suonensisäisen neste- ja lääkehoidon osalta. Olemme pyrkineet luomaan temaattisen synteessin kirjallisuuskatsaukseen sisältyvien tutkimuksien teemoista. Synteesiä luodessamme käsitelimme deskriptiivisesti ja analyttisesti tutkimuksissa julkaistut kuvat, taulukot, otsikot, avainkohdat, havainnot, tulokset ja päätelmät. Tutkimuksista nousi esille yhteensä yksitoista teemaa. Tutkimusten teemat olivat: potilasohjaus, henkilökunnan koulutus, ympäristö, käsihygieniat, aseptinen tekniikka, ihon puhdistaminen, periferisen suonikanyylin laittaminen, kanyylin kiinnittäminen, steriilin suojan ylläpitäminen, infuusioletkujen ja suonikanyylien vaihtovälit, dokumentointi ja käytäntöjen kehittäminen.</p> <p>Opinnäytetyömme tulokset osoittavat, että terveydenhuoltoalan ammattilaisten tulisi aina ottaa huomioon potilaiden alttius infektioille. Suonensisäisen neste- ja lääkehoidon käytäntöjä on tärkeää kehittää ja yhtenäistää IV-hoitoihin liittyvien infektioiden vähentämiseksi. Sen lisäksi terveydenhuoltohenkilökunnan ammattitaitoa ja osaamista tulisi vahvistaa jatkuvalla koulutuksella, jotta turvallisia ja parhaita IV-hoidon käytänteitä noudatettaisiin johdonmukaisesti.</p>	
Avainsanat	perifeerisen suonensisäisen hoidon, aseptiikka, sairaalaninfektio, infektioiden torjunta

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1 INTRODUCTION

“The very first requirement of a hospital is that it should do the sick no harm”

Florence Nightingale (1863).

There has been an increasing concern among health professionals and the general public about Hospital -Acquired Infection (HAI). Hospital -Acquired Infection is a major cause of morbidity and mortality (Creamer 2000:2144; Hart 2007:47) and up to 8.5% (range 5.0-9.6%) of hospitalized patients suffer from hospital acquired infection (Lyytikäinen, Kanerva, Agthe, Möttönen, Ruutu, et al. 2008:290). In a national and multicenter studies by (WHO 2011: 12), it was identified that the prevalence of hospitalized patients who acquired at least one hospital acquired infection ranged from 3.5% to 12%. This increasing concern in numbers of health care associated infections has prompted the need for further research into the area of asepsis.

Healthcare-acquired infections are defined as a localized or systemic condition resulting from an adverse reaction to the presence of infectious agents or its toxins (Lobdell, Stamou & Sanchez 2012:65). In this final project hospital acquired infections are defined as infections occurring in a patient during the process of care in a hospital or other health care facility which was not present and without evidence of incubation at the time of admission to a healthcare setting (Mirza 2012; WHO 2011:4). In this final project the terms nosocomial infections, Healthcare-Associated Infection (HCAI) and Hospital- Acquired Infections are used interchangeable and are all used to refer to infections that are acquired during the process of hospital care or other health care facility care.

The importance of asepsis in intravenous (IV) therapy has become an integral part of modern patient care because the number of patients who require IV therapy has increased due to changes in prescribing patterns and the acute nature of today's illness (Ingram & Lavery 2005:55). Almost 60% or more patients admitted to a hospital require the insertion of an IV cannula (Wilson 2001 cited in Hindley 2004:37).

It is known that Hospital acquired infections with antibiotic-resistant organisms such as methicillin-resistant *Staphylococcus aureus* (MRSA) are common and can be difficult to

treat. This takes us back to the question "Does the health care practitioner incorporate the principles of asepsis into daily patient care?" (Crow 1996:176). Studies have shown that infractions occur (Cousins, Sabatier, Begue, Schmitt, Hoppe-Tichy 2005; Ingram & Murdoch 2009).

This final project was a part of improving asepsis during the administration of peripheral intravenous therapy. This was a project conducted by the Metropolia University of Applied Sciences in collaboration with Helsinki University Central Hospital (HUCH). The aim of the project was to improve the safety of patients in infection disease clinic in HUCH.

2 CONCEPTS ASSOCIATED WITH THE STUDY

This chapter discusses the key concepts associated with the study. It discusses the concept of accurate peripheral therapy, asepsis, factors that influence the risk of infection, infections associated with IV therapy and guidelines and principles of asepsis in peripheral IV therapy

2.1 Accurate peripheral therapy

Peripheral intravenous cannulation is a procedure in which the patient's skin is punctured with a needle to allow insertion of a short temporary device usually into the veins of the forearm or hand (although other sites can be used) to administer intravenous fluids or medications (Aziz 2009:1242-1243;Hindley 2004:37).

Intravenous medications are vital in the management of hospitalized patients. Inpatients frequently receive several intravenous medications concurrently, and these are commonly delivered with infusion pump systems. Infections associated with intravenous therapy may either affect skin around the site of insertion of the catheter or the bloodstream (Wilson 2006:199).

Universal precautions and general infection control measures need to be considered when undertaking any clinical procedure, but when administering intravenous therapy,

specific measures need to be considered especially with vulnerable patients and those in the home setting (Higginson 2011: 10-23).

2.2 Asepsis

Asepsis is the absence of disease-causing microorganisms called pathogens (Kozier & Erbs 2008:670). Asepsis then, in this final project, will be defined as the practices that reduce the risk of infection to an irreducible number. Asepsis can be separated into two basic types: medical and surgical asepsis. Medical asepsis refers to infection control practices that endeavor to decrease the number and or transfer of disease producing organisms from one person or place to another. These practices are usually known as the clean technique. Surgical asepsis includes practices that keep objects and areas completely free of organisms, known as sterile technique (Duval 2010:445). Surgical asepsis aims at destroying all microorganisms and spores (Kozier & Erbs 2008:670).

Aseptic technique is a method employed to maintain asepsis and protect the patient from health care associated infections. The encyclopedia of Surgery online (2012) defines aseptic technique as "a set of practices and procedures performed under carefully controlled conditions with the goal of minimizing contamination by pathogens". However, the fact that there is a correlation between the practice of aseptic technique and rise in hospital infection rates has prompted for more evidence based practice about the procedure.

One very important challenge for modern medicine is Nosocomial infection (Pittet, Mourouga & Perneger 1999:126). The hands of healthcare workers are a major source of spread of nosocomial pathogens, as such hand decontamination is considered to be the cornerstone of infection control practice for all practitioners (Pettit 2000:381; Pittet, Mourouga & Perneger 1999:126). Asepsis is mostly associated with handwashing and wearing sterile attire. It is also knowing what is sterile and what is not sterile and keeping them apart (Crow 1996:176). Hand washing with soap and water has been considered a measure of personal hygiene for centuries and has been generally embedded in religious and cultural beliefs. The purpose of routine hand washing in patient care is to remove dirt and organic material as well as microbial contamination acquired by contact with patients or the environment (WHO 2009:30).

A number of studies have shown that hand washing causes a significant reduction in cross-transmission of antimicrobial resistant pathogens (e.g. Pettit 2000; Pittet, Mourouga & Perneger 1999). Adherence to hand hygiene is influenced by knowledge, beliefs, lack of education, lack of performance feedback, workload and type (e.g. working in critical care), lack of culture/tradition of compliance, tolerance and supportive attitude towards reported problems, negative influence of colleagues, skin irritation by hand-hygiene agents, lack of written guidelines, lack of recognition of hand-hygiene opportunities during patient care, lack of hand hygiene facilities (e.g. whether sink, soap, medicated detergent, or waterless alcohol-based hand-rub solution), and lack of awareness of the risk of microbial cross-transmission (Pettit 2000:383-384). Lack of knowledge of the correct hand hygiene technique, poor staffing and busy workloads also affect hand hygiene compliance (WHO 2009: 67).

2.3 Factors that influence the risk of infection

After an insertion of an IV device, within 48-72 hours a loose fibrin sheath appears around the intravascular portion of the device forming a nidus. This nidus act as a medium of protection as well as provides an ideal medium for the growth of multiple organisms (Vost 1997:846). A bacterium affects at least three out of a thousand admissions in acute hospital accounting for 6% of hospital acquired infections (Emmerson, Health protection agency 2003 cited in Wilson 2006:199). *Escherichia coli*, *Staphylococcus aureus* and *Enterococcus faecalis* are the most common infecting microorganism (Kozier & Erbs 2008:670) but the most associated with cannula tips are *Staphylococcus aureus*, *S. epidermidis*, *Kiebsiella spp*, *Pseudomonas spp* and *Candidas albicans* (Vost 1997:846). In Finland, the most common causative organisms, identified in 56% (398/703) of patients with HAIs, were *Escherichia coli* (13%), *Staphylococcus aureus* (10%) and *Enterococcus faecalis* (9%) (Lyytikäinen 2008:288).

Peripheral therapy is an invasive procedure. Consequently patients may experience serious, life-threatening, or life-altering complications even with diligent nursing care (Hadaway & Millam 2005:5; Rosenthal 2005:28) but most nurses consider peripheral cannulae to be of minimal risk to patients compared with nursing procedures such as care of pressure area (Creamer 2000:2136).

Vost (1997:848-850) noted that there are several factors that predispose the patients to IV-related infection. These include catheter material, catheter size, catheter

movement, experience of the personnel, duration of catheterization, composition of infusate, frequency of dressing change, skin preparation, repeated catheterization, presence of infection in other parts of the patient's body, nature of the infusion, number of access points and type of dressing.

To reduce the patients risk factors, Rosenthal (2005:28), Hadaway & Millam (2005:6) outlined the following general guidelines when inserting an IV device (though it may differ from one's hospital policies and procedures but it reflects the most common standards): The nurse should document the date and time of insertion, the type, length, and gauge of the catheter inserted, the name of the vein cannulated and the number of attempts, exact location of each attempt and the final successful site; the type of dressing applied to the site. Also the nurse should document how the patient tolerated the procedure and responses (direct quotes if possible), patient education you provided, any barriers to care or complications that occurred and how they were managed, and solutions delivered through the IV device (the types of fluids and medications infused through the catheter, including the infusion rate, dose, and diluent for all medication and any additives to the primary fluid). In case of deviations from hospital policy and procedure, the nurse should document the circumstances and the reasons for the deviation. Throughout the IV infusion, the nurse should also document the patient's tolerance of the therapy, site appearance (include standardized scales for phlebitis, infiltration, and extravasation, if they occur) and site care and reinforcement of patient and family teaching. The nurse should also assess the site and change dressings and equipment as directed by the facility policy and current clinical practice guidelines. The nurse should document all care, including catheter replacements, communication with other health care professionals related to the IV device, and when therapy was stopped as well if and why an armboard was applied.

These documentations are important in the sense that it records the nurses' actions, the patient's reaction, and clinical outcomes which can help to improve upon future IV therapy as well as prevent any unexpected legal litigations (Hadaway & Millam 2005:6; Rosenthal 2005:28).

2.4 Infections Associated with peripheral IV therapy

Patients are highly at risk of nosocomial infection when receiving IV therapy but in most cases the IV therapy is often not suspected as the source of infection (Maki 1994

cited in Crow 1996:175). The four most common microorganisms that cause infection in humans are bacteria, viruses, fungi, and parasites; although the majority of infections diagnosed are cases of bacteremia (Kozier & Erbs 2008:670). According to Adams and Elliott (2007:278), the four main routes by which microorganisms gain access to intravascular devices are extraluminal, intraluminal, haematogenous seeding or contaminated infusates. Infectious agents causing healthcare-associated infections may come from endogenous or exogenous sources (Kozier & Erbs 2008:670; Maki 2012). Endogenous sources originate from the patients themselves (e.g. nasopharynx) and exogenous sources include those that are not part of the patient (e.g. visitors, medical personnel, equipment and the healthcare environment) (Kozier & Erbs 2008:670; Maki 2012).

On the other hand, risk factors associated with catheter related infections can be categorized into patient-related and hospital-related (Crow 1996:175-176). Hospital related infection include type of cannula, the method of insertion, the duration with catheters inserted for longer than 48-72 hours increasing the risk (Creamer 2000: 2128), the skill of the person placing the catheter and subsequent patient care (Crow 1996: 175). Patient susceptibility (Creamer 2000: 2128), age, altered host defenses, severity of the underlying disease are some of the patient's related infections (Crow 1996:175). Ingram and Murdoch (2009:51) categorized sources of infection in IV therapy into intrinsic and extrinsic. Intrinsic occurring as a result of contamination or faulty sterilization of fluids or equipment during manufacturing, and extrinsic as a result of contamination of the peripheral cannula during insertion, administration of IV medication and fluids or from the hands of the healthcare professional inserting or manipulating the device.

The most common complications associated with cannulation are phlebitis, infection, haematoma, infiltration, extravasation, transfixation and thrombus (Trim 2005: 655). Phlebitis, which is the inflammation of the vein wall with subsequent complications of infection and thrombosis (Hindley 2004:38), remains the most common complication associated with the use of peripheral venous catheters (Lavery & Ingram 2006:51). It can be classified into mechanical (due to cannula problems which cause trauma to the intimal wall of the vessel), chemical (consequence of compositions and concentration of the infusate) and infection (occurs when the tip of the cannula is infected) depending on the cause (Ingram & Lavery 2005: 61-62). A number of factors,

including the type of infusate and the catheter material and size influence a patient's risk for development of phlebitis (Pearson 1996:263). The occurrence of phlebitis increases the patient's risk of developing local catheter-related infection. Routine or scheduled replacement of intravascular catheters has been advocated as a method to prevent phlebitis and catheter-related infections (Pearson 1996:269).

More recent studies have shown no increase in cannula related complications, including phlebitis or thrombophlebitis, when the duration was prolonged from 72 to 96 hours (Lai 1998:68; Creamer 2000:2148; Trim 2005:658; Aziz 2009:244). This may mean that routine replacement is not necessary, but that each cannula should be checked daily and if any evidence of clinical infection is detected, the cannula should be removed immediately (Aziz 2009:244; Creamer 2000:2148).

Most studies have advocated that proper skin preparation before IV medication (2% chlorhexidine and 70% alcohol) for 30 seconds has shown to reduce infection (Aziz 2009:244; Hadaway & Millam 2005:4). Stonecypher (2009:95) noted that proper skin preparation is a function of the solution used to clean the skin, the technique used in applying the solution (concentric circles vs. back-and-forth friction) and the length of time the solution is allowed to dry on the surface.

2.5 Guidelines and principles of asepsis in peripheral intravenous therapy

Administering intravenous therapy is one aspect of the nursing profession but with restrictions. To be able to administer an effective intravenous therapy, the nurse needs an extensive knowledge on intravenous therapy, including all types of vascular access devices, treatments and the prevention and management of local and systematic complications (Dougherty 2000:61).

In the US, nurses administering intravenous drugs and working in a more specialist role are expected to pass an exam to gain a CRNI (certified registered nurse intravenous) qualification and to maintain this qualification by attending national IV conferences and other workshops to gain points for recertification every 3 years (Infusion nurses certification corporation). In Finland, one needs to attend and pass an IV administering workshop, most cases organized by the health institution where one works before gaining a license. The IV permit gained in one municipality may or may not be accepted in another municipality.

Catheter- related bloodstream infections are a major source of morbidity and mortality especially among hospitalized patients (Parker 2002:246). Most and current guidelines recommend a number of strategies to reduce the incidence of catheter related bloodstream infections. These include applying the principles of asepsis, the choice of catheter material, the site of insertion and when to replace the equipment used (Parker 2002: 240).

Lavery (2011:28) asserted that “the preparation and administration of intravenous (IV) medications requires competent practitioner, supported by robust evidence based practice”. Lavery further said that it also requires time and careful assessment, which includes assessment for the procedure, practitioner’s competence, patient, medication(s), the equipment, the environment, and other associated aspects (e.g. infusion devices).

Crow (1996:175) outlined the principles of asepsis as follows: Appropriate hand washing, the use of sterile barriers during insertion of central lines, disinfection of ports before entry, appropriate dressing changes and risk assessment of new technologies.

3 STATISTICS ON HOSPITAL ACQUIRED INFECTIONS.

Infection control, as a practice, and formalized approach to HAI began in the middle of 1950s and 1960s, when severe and extensive epidemics of staphylococcal infections among hospitalized patients led health care providers to focus on the problem of nosocomial infections (Larson 1997: 340).

In Finland, 8.5% (Lyytikäinen, Kanerva, Agthe et al. 2008:290) of patients admitted to hospital had at least one healthcare-associated infection (HCAI) in 2005 but was 9.1% according to the Burden of Endemic Health Care-Associated Infection Worldwide in 2010 (WHO 2011:13). The prevalence rate was between (2-20%) and types of HAIs varied widely between different specialties. In the United Kingdom, 8.2% of patients admitted to hospital developed healthcare-associated infections (HCAIs) in 2006 (Smyth, McIvenny, Enstone , et al. 2008:234) but 9% in 2011 according to the WHO’s report on the Burden of Endemic Health Care-Associated Infection Worldwide 2010

(WHO 2011:13). These increases have led to the need for safe and competent practice during peripheral IV cannulation and IV care as a whole (Lavery 2010:S6).

According to the WHO (2011:14) report on the Burden of Endemic Health Care-Associated Infection Worldwide , the European Centre for Disease Prevention and Control (ECDC) reported that approximately 4 131 000 patients are affected with about 4 544 100 episodes of HCAI every year in Europe with a mean HCAI prevalence of 7.1%. The estimated HCAI incidence rate in the USA was 4.5% in 2002, corresponding to 9.3 infections per 1000 patient-days and 1.7 million affected patients. What is more alarming is that in Canada HCAIs rate is at 11.6%, Turkey 12.5% , Brazil 14%, Norway 5.1% , Belgium 6.9%, but lower in Germany 3.6%, France 4.4% , and rather encouraging in Ghana 6.7% though higher, according to WHO's Report on the Burden of Endemic Health Care-Associated Infection Worldwide 2011 (WHO 2011:13 &17).

Because of the prevalence of HCAIs, infection control experts everywhere are working to identify and correct factors that contribute to these high rates. It is alarming to know that the true incidence of intravenous therapy related bloodstream infections is underestimated in most institutions worldwide because the intravenous therapy is often not suspected as the source of the infection (Maki 1994 cited in Crow 1996:175).

Damani (2004) outlined that, transmission of a pathogen resulting in colonization or infection requires the following six vital links starting from infectious agent, reservoirs, portal of exit, means of transmission, portal of entry and susceptible host (figure1).

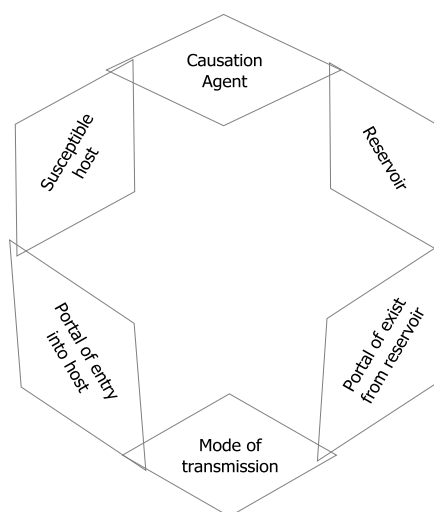


Figure 1: Chain of infection. Adapted and used with permission from Damani (2004)

Before infection can occur, each stage must be present and in a sequential order starting with the causation agent. Lavery and Ingram (2006) suggested that, to ensure high standards of practice, the chain of infection should be used as a guide to practice.

Vost and Longstaff (1997) made an overview concerning the current literature surrounding IV devices and infection control issues. This included the pathogenesis of infection, the importance of hand washing, the influence of catheter material, insertion techniques, the duration of line placement, the controversy over skin preparation and the choice of dressing. The study revealed that all health care professionals must be held accountable for every aspect of IV therapy, including the control of infection.

Crow's (1996) study shows that patients are at a high risk of nosocomial infection when receiving IV therapy. This risk can be reduced by understanding the technology of new devices and incorporating infection control principles such as appropriate handwashing, using sterile barriers during insertion, disinfection of ports before entry and appropriate dressing changes during IV therapy.

Hindley (2004), on a study on prevention of infection in peripheral intravenous devices found out that the two most important complications associated with the clinical use of peripheral cannula were infection and phlebitis. Hindley concluded that frequent knowledge update by nurses coupled with regular surveillance for nurses involved in the care and management of patients with peripheral cannula should help to give the most recent and best care possible to the patients.

Dugger (1997) advocated the need for all nurses and physicians to be educated about the healthcare's guidelines for the management of peripheral catheters. Also proof of IV competency should be required of all nurses' entrance into and continuation in clinical practice. Compliance with the guidelines served as an important measure for the prevention of intravascular device related complications. On patients' education Grant (2012) found out when patients are educated visually through leaflets and posters and having information available to them whenever they want to explore, improves patients' IV medication process, and also leads to more collaboration and efficiency.

Creamer (2000) examining nurses issues in the care of patients with peripheral venous cannulas in order to minimize the risk of infection found out that effectiveness in

practice rests not solely on individual professional aspects but must be harnessed to organizational support systems. Creamer suggested that nurses need to document the care and management of peripheral cannula so that the insertion, presence and removal are recorded, as well as making daily checks for signs of infection, discomfort or the need for dressing changes. Creamer pointed out that, healthcare professionals follow practiced routines of care delivery without questioning or considering the rationale and that, education is needed to ensure an excellent cannula care.

On the cost burden, studies (Orsi, Stefano & Noah 2002; Tarricone, Torbica, Franzetti & Rosenthal 2010) have shown that infections acquired in hospital impose a significant burden on both patients and hospitals, they increase hospital length of stay by approximately 17-19 days in Italy (Orsi, Stefano & Noah 2002:195; Tarricone, et al.2010:1), 28 days in Finland (Kanerva et al. 2009: 228) as well as the overall cost of care. When good strategies are kept in place to reduce the incidence of these infections they positively have a good impact not only on patient quality of life but also hospital budgets (Parker 2002:240; Tarricone, Torbica et al. 2010:8).

Many studies have examined the interval replacement of IV administration set and data reviewed that replacing administration sets within 72-96 hours is safe and cost-effective (Creamer 2000; Lai 1998; Tarricone, Torbica et al. 2010). Lai's (1998) observational study on the length of time that peripheral IV line can be safely left at the same site found out that there was no significant in the phlebitis rate between 72 hours and 96 hours (3.3% vs. 2.6% respectively). Lai concluded that for patients with low risk of infection, the peripheral IV cannula might be left in place relative safety for 96hours. Creamer (2000:2142) pointed out that peripheral IV cannula can be prolonged on patients for more than 72 hours based on the risk factors.

Throughout the course of this literature review, most studies have concluded that competency in intravenous therapy is a vital part of the nurse and all health care practitioners job. Standard guidelines on IV therapy coupled with the right aseptic technique, can result in an excellence infusion care for patients. It was also reviewed that there are many areas of current clinical practice where the evidence base concerning intravenous therapy is weak and needs to be strengthened by further research.

4 PURPOSE AND RESEARCH QUESTION

The purpose of the final project was to describe the principles' involved in the preparation, administration and management of peripheral intravenous therapy in the clinical setting.

This final project tried to answer the research question: what principles are utilized in the preparation, administration and management of peripheral intravenous therapy in the clinical setting?

This final project helped to outline the existing principles involved in the preparation, administration and management of peripheral intravenous therapy in the clinical setting. It also helped the nursing community and health care institutions in standardizing IV practice to reduce the risks of infection and to employ evidence based practice in nursing care.

The final project is of great relevance to nursing community because it helps to outline the safe standards of nursing practice in the preparation, administration and management of peripheral intravenous medications which help to improve the patients' and the health workers' quality of life.

5 METHODOLOGY

5.1 Systematic Literature review

In most contemporary literature, the term systematic refers to 'methodical', or something 'done or conceived according to a plan or system' (Jones & Evans 2000: 66). The term review is defined as 'a report on a subject or on a series of events' (Oxford Advanced Learners Dictionary 2010). In this final project therefore; a systematic review was defined as a methodical report/assessment of a subject using a predetermined plan (Jones & Evans, 2000: 66). Systematic literature review is performed using data from original authors' reports or publications.

In most research literature, a systematic review has been defined as an application of scientific strategies, in ways that limit bias, with pre-planned methods that summarize, critically appraise, synthesize and communicate the results of a specific clinical question (Cook, Mulrow, & Haynes 1997:377; Windle 2010:40; Jones & Evans 2000:66). The specific clinical question in this final project was what principles are utilized in the preparation, administration and management of peripheral intravenous therapy in the clinical setting?

Evans and Benefield (2001:533-7) set out six principles for undertaking systematic reviews. These included a clear specification of the research question which is being addressed; a systematic, comprehensive and exhaustive search for relevant studies, clear criteria for including and excluding studies (e.g. data extraction criteria, the intervention made, the population and sampling, type of study), assessments of the quality of the methodology used in the study, the specification of strategies for reducing bias in selecting and reviewing studies and transparency in the methodology for carrying out the studies. These principles were the cornerstone to our project from the beginning to the conclusion.

In systematic literature review, when the results of primary studies are summarized but not statistically combined, the review is termed qualitative systematic review, on the other hand, a quantitative systematic review, or meta-analysis, when statistical methods are used to combine the results of two or more studies (Cook, Mulrow & Haynes 1997:377). We used qualitative systematic review in our study because our results were summarized but not statistically combined.

Systematic review involves well-planned carefully systematic process that need to be followed including the selection of studies for inclusion, critical appraisal of studies, data extraction and data analysis. Nurses who intend to undertake a systematic review should try to provide a critical and rigorous report that can inform nurses of their practices by providing guidelines on effective or ineffective nursing intervention (Jones and Evans 2000:70). This final project took that course of trying to find an intervention in respect of asepsis when delivering IV therapy in a clinical setting. We intended to provide an accurate report on the newest principles that need to be followed during IV therapy. Jones and Evans (2000:70) asserted that, "it is not an easy process and requires considerable time and resources to ensure the precision, accuracy and validity

of the review process are enhanced, but it is vital to ensure effective health care practices are maintained". These points out the limitations associated with this study. For instance there is limited time and resources associated with final project work at Metropolia University Applied Sciences. This made it somehow difficult to justify the validity of the present study.

There are a lot of limitations associated with systematic literature review but the limitations do not come closer to the valuable importance of systematic literature review for health practitioners, researchers and policy makers as it is often seen as an accompaniment to evidence-based approaches. If well conducted, systematic reviews can help to keep as up-to-date, define the evidence on a topic by stating what is known, and what is not known, avoid knowing less than already known about a given topic (Cook, Mulrow & Haynes 1997:378), because it summarizes information objectively, identify knowledge gaps, and often recommend interventions for specific clinical questions (Windle 2010:40).

The EPPI-Center at the University of London indicated that systematic reviews are characterized by several criteria (<http://eppi.ioe.ac.uk/cms/Default.aspx?tabid=67>):

- They use explicit, rigorous and transparent methods, which must be applied systematically;
- They synthesize research studies, based on explicit criteria, in order to avoid bias;
- They are accountable, able to be replicated and to be updated;
- They are required to be relevant and useful to users;
- They are intended to answer specific research questions;
- They are evidence-based

5.2 Search strategy and data extraction

This systematic literature review aimed to describe the principles' involved in the preparation, administration and management of peripheral intravenous therapy in the clinical setting with focus on asepsis. As such, we outlined a general search strategy along with individual key words as outlined in Figure 2 and figure 3.



Figure 2: Article Review process of the Final Project.

The primary databases used were EBSCO (CINAHL), OVID (MEDLINE), and PubMed. Initial searches were done in December 2011 in extracting information regarding the topic of our research for the outline presentation, example keywords used were asepsis, parenteral medication, pneumonia, antisepsis, intravenous therapy, infection control. The search result at that time seemed extensive, many articles needed payment, membership, or login information to be accessed, the articles were browsed through by titles and eliminating those that seems out of the topic. The search gave as good background information which gave the authors something to start in the building up of relevant title and research questions. During the outline presentation, feedbacks were received and collated and additional keywords were added (e.g. antibiotic, IV medication) and others removed (e.g. antisepsis, pneumonia).

The implementation of the second phase of our research was done in February 2012. The following final keywords were used: Intravenous Therapy AND Asepsis, Antisepsis AND IV Therapy AND antibiotic, Infection control AND IV Therapy, and IV Medication for all database search engines (Appendix 1).

Studies were included only if they were available in full text, an empirical research, were peer-reviewed, published in English, were not descriptions of previously reported findings (original articles), articles with abstracts/Summary, the study is related to our topic, related to nursing, studies involving humans, the study answers to the research questions and study is published between 2005 – January 2012.

The search on CINAHL resulted in 30 articles, of which 12 articles were selected. PubMed searches led to 507 results; none of articles were relevant to the study so all were rejected. The database search on OVID (Medline) yielded 598 results of which 17 were relevant. The searches and results are illustrated in Figure 3 below.

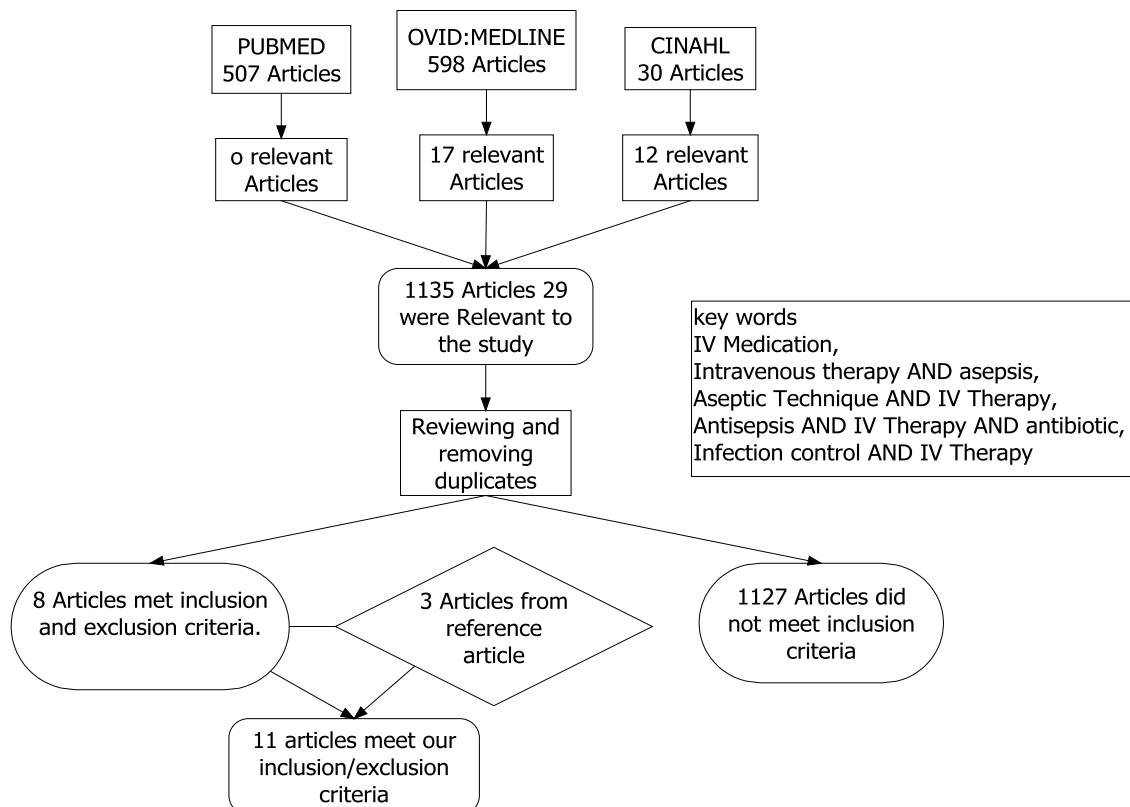


Figure 3: A flowchart showing the method of article abstraction and selection for the study.

Collectively, after removing duplicates we were left with 1126 articles for the total search of which 29 relevant articles chosen for the analysis. Eight articles were then chosen for the final analysis. Three extra articles were selected from the reference list.

Full-text publications were obtained for the studies that were relevant and met our inclusion/exclusion criteria and both authors independently reviewed each article (Appendixes 1 and 2). Disagreements were resolved by discussion and consensus between the two authors.

5.3 Detailed thematic synthesis

We used the technique of thematic networking (Attride-Stirling 2001) and thematic synthesis as described by Thomas and Harden (2008) to develop initial categories to which themes from combined findings of each included study could be assigned. We decided to use thematic synthesis because as Thomas and Harden (2008) put it "In the case of synthesis, reviewers translate themes and concepts from one situation to another and can always be checking that, each transfer is valid and whether there are any reasons that understandings gained in one context might not be transferred to another", that is grounding the text in the context in which it was constructed.

From each article, we extracted all the text, figures, tables under the heading 'key points', 'results' or 'findings' and 'discussion' or 'conclusion'. The synthesis took the form of three stages: the free line-by-line coding of the findings of primary studies; the organization of these 'free codes' into related areas to construct 'descriptive' themes; and the development of 'analytical' themes.

The first two stages involved coding the text and developing descriptive themes: we selected one paper, coded the text and recorded concepts that related to the preparation, administration and management of peripheral IV medication with focus on asepsis and identified common and divergent concepts and ideas. All papers were analyzed similarly, and we translated the concepts from one study to another by adding coded text to existing concepts or created a new concept when necessary. The papers were read again to ensure that all the text relating to IV therapy with focus on asepsis were included. The concepts were examined for any similarities or differences and then organized into a structure of descriptive themes.

We originally planned to extract the study findings according to our pre-established coding framework based on the principles in preparation, administration and management of peripheral IV therapy. The extraction of themes initially identified sixty-three categories which encompassed all thematic content. Three broad organizing themes encompassing thirty-eight themes emerged (Appendix 12). Before completing this stage of the synthesis, we also examined all the text which had a given code to check consistency of interpretation and to see whether additional levels of coding were needed.

We realized that the three themes cannot answer our research question fully and we conducted a further thematic analysis (third stage) which we thought will provide a specific and non-repetitive view of the findings of our study.

The third stage generating analytical themes was the most difficult stage of the process. It was dependent on the judgment and insights of the reviewers (Thomas & Harden 2008). To extend the findings offered by the primary studies, we mapped the interrelationships between the themes to develop additional concepts or analytical themes. New codes were created to capture the meaning of groups of initial codes. A cyclic approach was used until the new themes were all abstracted. The three themes comprising of thirty-eight codes were arranged into broad groupings, on the basis of related conceptual content. Eleven broad organized analytical themes emerged. These themes were used to answer our research question. The themes were considered as relating to education of patients and health professionals, environment, hand hygiene, aseptic technique, skin preparation, insertion of peripheral catheter, catheter-site dressing, maintaining sterile barrier, replacement of administration sets and peripheral catheters, documentation and performance improvement. All study themes were represented within this process, including themes which only occurred in one study. Some themes were more prominent than others. This can be seen from the frequency with which they occurred across studies (e.g. adherence to hand hygiene). Some themes overlapped.

6 FINDINGS

As described above, eleven themes were identified: Education of patients and health professionals, environment, hand hygiene, aseptic technique, skin preparation, insertion of peripheral catheter, catheter-site dressing, maintaining sterile barrier, replacement of administration sets and peripheral catheters, documentation and performance improvement.

6.1 Education of patients and health professionals

The importance of educating and training nurses in the preparation, administration and management of peripheral intravenous therapy was evident from our review. For infection prevention procedures to be successful, all nurses are involved in implementing procedures that are aimed at reducing the risk. Designate nurses equipped with the required knowledge on IV therapy to prevent infection occurring. Assess the knowledge of nurses and all persons who are involved in inserting and managing IV therapy. Educate and train all health professionals associated with IV therapy with the necessary skills to anticipate problems and take actions to prevent them occurring (Morris & Tay 2008:S21). Ensure regular and comprehensive training programs with theoretical and practical elements are given to nurses for safe and effective practices and skills kept up-to-date throughout their practice life time (Lavery 2010:S8; Trim 2005:658).

Educate healthcare personnel regarding the indications for IV catheter use, proper procedures for the insertion and maintenance of IV catheters, hand hygiene, the need to apply the principles of asepsis during the insertion and appropriate infection control measures to prevent catheter-related infections (Hart 2007:47; Lavery & Ingram 2006:56;Scales 2008:S12).

Give patients the appropriate education and encourage patients to report to the nurse any changes in their catheter site or any new discomfort (i.e. report any swelling, redness, tenderness, drainage, shoulder pain, or chest discomfort) (Ingram & Murdoch 2009:53; Lavery 2010:S8; Lavery & Ingram 2006:53). Empower patients to take responsibility of their care including knowing the signs and symptoms of early signs of infection (Aziz 2009:246; Lavery & Ingram 2006:53; Trim 2005:558). Seek consent from patients and give comprehensive explanation of the procedure, including

its indications and contraindications (Ingram & Murdoch 2009:53; Hart 2007:44; Trim 2005:654).

6.2 Environment

Ensure that the environment where the IV procedure is going to take place is identifiable, designated and clean (Curran 2011:S7; Hart 2007:44; Ingram & Lavery 2005:59; Ingram & Murdoch 2009:51; Lavery 2010:S8; Scales 2008:S10). These include ensuring that at least 30mins has elapsed after bedmaking /domestic cleaning has finished (Ingram & Murdoch 2009:51) and the nurse is be able to work uninterrupted or free from distraction (Ingram & Lavery 2005:56). All equipment's are stored in a dry, clean and safe place (; Hart 2007:44; Ingram & Lavery 2005:59; Lavery 2010:S8).

6.3 Hand hygiene

Do a risk assessment to determine appropriate hand hygiene method and solution (Hart 2007:44; Ingram & Lavery 2005:60; Ingram & Murdoch 2009:52; Lavery & Ingram 2006:52; Morris & Tay 2008:S21). Cover cuts or broken skins with water-proof dressing (Hart 2007:46). Decontaminate hands correctly before collecting equipment, palpating the veins, cannulation, and placing gloves on hand, repeat after removing gloves (Morris & Tay 2008:S21) and immediately before and after contact with patients (Lavery 2010:S8, Hart 2007:44; Morris & Tay 2008:S21; Aziz 2009:244; Lavery & Ingram 2006:52). Encourage and promote the use of alcohol handrubs for all members of the healthcare team, patients and visitors (Lavery & Ingram 2006:51). Avoid wearing wristwatches, stoned rings, long fingernails and long sleeves when in clinical areas as they interfere with hand decontamination (Hart 2007:46; Morris & Tay 2008:S17).

Adhere to hand hygiene throughout the cannula care according to local/hospital policy (Aziz 2009:244; Curran 2011:S7; Hart 2007:46; Ingram & Lavery 2005:60; Ingram & Murdoch 2009:52; Lavery 2010:S8; Lavery & Ingram 2006:52; Morris & Tay 2008:S21; Rowley, Clare, Macqueen & Molyneux 2010:S8; Scales 2008:S10; Trim 2005:656). To improve compliance with hand hygiene, healthcare practitioners and nurses in particular are encouraged to challenge poor hand hygiene practices (Morris & Tay 2008:S17). Use new or clean sterile gloves before handling, inserting and changing

dressing of peripheral IV catheter (Aziz 2009:244; Hart 2007:45; Lavery 2010:S14; Morris & Tay 2008:S18).

6.4 Aseptic technique

Do a risk assessment before the procedure to help protect key parts and key sites (Ingram & Lavery 2005:58; Ingram & Murdoch 2009:52; Morris & Tay 2008:S18). Maintain aseptic technique when preparing, administering and all further manipulations of the IV system to reduce infection (Curran 2005:S7; Ingram & Lavery 2005:59). Employ aseptic non-touch technique to ensure key parts are kept sterile (Ingram & Murdoch 2009:53; Lavery 2010:S14; Rowley, Clare, Macqueen & Molyneux 2010:S9; Scale 2008:S10). Wear clean or sterile gloves when changing the IV dressing. Replace a peripheral IV catheter inserted in an emergency situation where an aseptic technique was compromised within 24 hours (Aziz 2009:124). A non-touch technique is advocated whether healthcare professional are wearing gloves or not, and regardless of glove type, as sterile gloves can still become contaminated (Rowley et al. 2010:S9).

6.5 Skin preparation

Skin preparation is a function of the solution used to clean the skin, the technique used in applying, and the length of time the solution is allowed to dry on the surface. To allow a clean working surface and prevent microbial contamination, decontamination of the proposed punctured site was recommended (Morris & Tay 2008: S18). If the skin is visibly dirty, wash the site with soap and water (Ingram & Murdoch 2009:53; Trim 2005:657) and when the skin is visibly clean, prepare the skin with 2% chlorhexidine in 70% isopropanol alcohol and leave the site to dry for at least 30 seconds (as per local policy), (Aziz 2009:244; Lavery 2010:S12; Lavery & Ingram 2006:53; Trim, 2005:657; Scales 2008:S5.; Wendy & Tay 2008:S16) starting at the insertion site and working outwards using a back and forth motion (Ingram & Murdoch 2009:53). Allow the antiseptic to remain on the insertion site for an appropriate length of time to dry according to manufacturer's recommendation before inserting the catheter (Ingram & Murdoch 2009:53; Trim, 2005:657).

6.6 Insertion of peripheral catheter

Ensure thorough assessment, planning, skillful insertion of the device, and continuous regular monitoring (Lavery 2010: S10; Morris & Tay 2008:S21), maintenance and keeping accessible records will help reduce infection risk (Lavery & Ingram 2006:56).

Avoid lower extremities, joints or nerves when siting the cannula (Ingram & Lavery 2005:60; Scale 2008:S5). Reduce the number of attempts for cannulation as increased puncture sites increases the risk of infection (Ingram & Lavery 2005:60). Designate trained personnel for the insertion and maintenance of IV medication (Morris & Tay 2008:S21).

6.7 Catheter-site dressing

The main reason for patients' catheter site dressing is to preserve the site and prevent external contamination. Use transparent dressing because it permits continuous visual inspection of the catheter insertion site for any signs of phlebitis (Aziz 2009:244; Morris & Tay 2008:S21). Secure the dressing to prevent movement of the cannula (Morris & Tay 2008:S21), which would increase the risk of carrying micro-organism from the skin, or causing infiltration or extravasation of drugs or fluids (Lavery & Ingram 2006:53; Trim 2005:657). Dressing changes require an aseptic non-touch technique (Scales 2008:S5). Replace dressings when loose, wet or soiled and monitor site using a phlebitis scoring tool (Scales 2008:S5). Encourage patients to report any changes in their catheter site or any discomfort ((Lavery 2010:S8; Lavery & Ingram 2006:53; Ingram & Murdoch 2009:53).

6.8 Maintaining sterile barrier

The reviews suggest that if maximal barrier precautions are used during insertion, catheter contamination and subsequent related infections can be minimized. Use personal protective clothing (gloves, apron and eye/face protection) based on a risk assessment (Aziz 2009:244; Hart 2007:45; Lavery 2010:S14; Morris & Tay 2008:S18). For instance if the nurse feels that during the procedure he/she may come into contact with blood or body fluids, then the appropriate protective clothing must be worn to prevent cross-infection (Ingram & Lavery 2005:57; Lavery & Ingram 2006:52; Ingram & Murdoch 2009:51). Ensure that packages are intact and up to date before they are opened (Hart 2007:44; Ingram & Lavery 2005:59; Ingram & Murdoch 2009:53; Lavery & Ingram 2006:51). Comply with aseptic technique when opening packages (Lavery & Ingram 2006:51-52) and when preparing medication (Curran 2011:S7; Ingram & Lavery 2005:57). Intravenous medications are prepared in a visibly/designated/identifiable clean environment (Curran 2011:S7; Hart 2007:44; Ingram & Murdoch 2009:51-52; Lavery & Ingram 2006:51; Scales 2008:S10). Needleless devices are preferred to the use of bungs to maintain a closed IV system (Scales 2008:S10).

6.9 Replacement of administration sets and peripheral catheters

Scheduled replacement of catheters was proposed as a means to prevent phlebitis and catheter-related infections (Lavery & Ingram 2006:54; Scales, 2008:S10). To reduce discomfort, the risk of phlebitis and catheter-related infection, replace peripheral catheters sites at 72 hour intervals. Many of the studies examined the interval replacement of IV administration sets and data showed that, replacing administration sets within 72-96 hours is safe and cost-effective (Aziz 2009:244; Lavery & Ingram 2006:54; Trim 2005:658). There is no need to replace peripheral catheters more frequently than every 72-96 hours to reduce risk of infection and phlebitis in adults (Trim 2005:658). The review therefore recommended replacing at new site after 72-96 hours or earlier if indicated clinically (Aziz 2009:244; Lavery & Ingram 2006:54). Further recommendations in the review are that, label all IV administration sets with the date and time they are opened and change appropriately: solution sets-change at 72 hours; blood sets- change at 12 hours; lipid-containing solutions-change at 24 hours (Scales 2008:S:10). Keep add-on devices to a minimum and change as recommended by the manufacturer (Lavery & Ingram 2006:54; Scales, 2008:S10). In general, change 3-way taps every 72 hours, bungs (single use, or changed at 72 hours if not removed from device), and needleless devices changed according to manufacturers' instructions (Aziz 2009: 244; Lavery & Ingram, 2006:54; Scales, 2008:S10). Remove any IV sets that are no longer essential and discard administration sets after disconnection (Scales 2008:S10). Ensure nurses understand the care and management of the devices used in IV therapy (Lavery & Ingram, 2006:S4).

6.10 Documentation

Documentation encourages research-based standardized practice, provides guidance as well as evidence of competence (Trim 2005:654). Use a peripheral cannula care plan during IV therapy since it aids in regular monitoring and record keeping (Aziz 2009:244; Lavery & Ingram 2006:56; Morris & Tay 2008:S19). Document the date and time of insertion of the cannula since accurate documentations demonstrate better cannula care (Aziz 2009:244; Morris & Tay 2008:S21). Label IV equipment and fluid containers with date and time they are opened to ensure they are changed appropriately (Scale 2008:S10).

6.11 Performance improvement

This involves translating research findings, hospital/local policies and evidence-based recommendations into clinical practice (Aziz 2009; Morris & Tay 2008; Trim 2005:654). Hospital policies/guidelines may act as training manual, establish supervised practice competence and also includes the review of quality improvement studies on IV therapy as in this final project work, constant education of healthcare personnel (Lavery 2010:S8; Morris & Tay 2008:S21; Trim 2005:658) and constant evaluation of catheter-related bloodstream infections (CRBSI) programs and practices (Morris & Tay 2008.S17).

One aspect of performance improvement realized throughout the study was that, educational policies are primarily geared towards hand hygiene, documentation, setting sterile barrier during insertion, appropriate insertion site selection, proper site care using chlorhexidine gluconate (2% chlorhexidine in 70% isopropanol alcohol), and immediate removal and disposal of unwanted catheters. There was one intervention studies (Aziz 2009) on peripheral IV cannula care and this study reported that the risk of infection to patients can be reduced if health care staff consistently complies with evidence-based practices and guidelines every time they undertake a clinical procedure on infection prevention measures.

Finally, emphasis on the care and maintenance of catheters once they are in place should be a focus for performance improvement. A post-insertion study on nurse's practice and knowledge on IV medication can help identify aspects of IV care that needs improvement.

7 ETHICS AND VALIDITY

As nurses we are in an ideal position to promote the role played by research in the advancement of science and improvement in patient care (Lobiondo-Wood & Haber 2010:247) as well as obliged not to inflict any harm to people and protect them from acquiring illness and its effects, whenever possible (Fry & Johnstone 2002:78). The methodology in conducting systematic literature reviews makes is somehow difficult to include ethical issues from the original articles because most of the articles don't

comment on it. It would have been a good idea to give a concise ethical assessment of the original studies in this project, but because of the limited resources and time concerning this study and also most papers giving a limited account of the process we could not provide readers such report. Ethical issues change with time and place so that, during our study we could not come across any universal, internationally accepted standard for ethical assessment in systematic literature reviews. A known ethical assessment in systematic literature review could have helped in the quality of our studies. We therefore consented to the normal way of doing systematic literature review.

To be ethically objective, we devoid of our own interpretation and opinion in the analysis. Only data from original authors' reports or publications were used. We reported all queries that came out during our searches and abstract of relevant articles were read to include/exclude. We also made sure that data collection conform to scientific and Metropolia guidelines. Plagiarism, fabrications, guessing of the work was avoided based on the two authors' knowledge concerning those matters.

We used our own conscience to pre assume that ethical issues were fully addressed in all the articles that were included in the study because the articles were mostly published in first class journals with strict ethic codes.

Validity is the extent to which an instrument measures the attributes of a concept accurately (LoBiondo-Wood & Haber 2010:286-288). To go by the traditional meaning of why do systematic reviews, that is, to answer an empirical question based on an unbiased assessment of all the empirical studies that address it. Stretch & Softer (2012:125) recommend that: First, there should be at least two reviewers. They should assign reason types mention independently, and identify, discuss and resolve discrepancies. When disagreement persists, the underlying reasoning should be stated and an independent person should be asked to break the tie.

This was done in the form of a draft to the supervisor and the comments use to sort the discrepancies. Also issues are emailed to our supervisor to assert her comments and decision taken thereafter. We also independently reviewed each article and later compared notes for the final conclusions.

Secondly, the analysis should not imply greater precision than exists in the literature.

We reviewed the literatures in an objective way, without being influenced into adding our own opinions and interpretations.

Lastly, when broad types overlap or cover various narrow types, reviewers should present data on narrow types whenever practicable.

We devoid of vogue statements and rather concentrated on issues very specific to the study area. We discussed the limitation of the study with respect to the IV therapy with respect to systematic review from January 2005 to January 2012.

During the course of our final project we realized the lack of standardization between the various databases (CINAHL, PubMed, and MEDLINE). This prompted us to give a vivid account of the search strategies so that our work can be replicated. Since our search relies mostly on electronic databases and references lists identification of the research topic, we were faced with the risk of publication bias. This biasness could have been reduced by including articles that are not peer reviewed rather than only in peer reviewed journal(Jones & Evans 2000:68), and extend the year range, but limited time and resources associated with final project work at the Metropolia University of Applied Sciences could not permit that.

8 CONCLUSIONS AND DISCUSSIONS

Reflecting on the statement by Florence Nightingale (1863) that "...the very first requirement of a hospital is that it should do the sick no harm" coupled with the high risk of patients getting nosocomial infection when receiving IV therapy, prevention of peripheral intravenous cannula infection and it's control is only sustainable if there is a commitment from all levels of the healthcare institutions. As Morris and Tay (2008:S21) put it "infection prevention is everyone's business".

Nurses are increasingly becoming responsible for most aspects of IV therapy. Their role in the management or care of IV access devices have changed over the years. With advances in technology and an increased involvement in the selection of the device and its insertion; maintenance and removal has become an integral part of the nurses' role. With such advances in practice, it is a necessity that nurses have the tools to

assist them in evaluating practice and implementing change where required. One such tool during this review was a high impact tool being used by University Hospital of South Manchester NHS Foundation Trust (UHSM) and this has resulted in improvements in peripheral IV catheter care across the Trust (Aziz 2009).

Nurses have a duty to work with colleagues to protect and promote the health and wellbeing of those in their care. Because of the infection risk with IV therapy, it is essential that nurses incorporate good aseptic technique into IV practice. A further benefit of a good aseptic practice is that it can reduce expenditure on IV devices and promote more effective management of complications, and therefore has benefits for patient care (Gabriel 2008).

Nurses employing aseptic technique needs to undergo formal education. Education must first involve an approved educational session followed by practical competency in aseptic technique to ensure the procedure is applied correctly. Adherence to hand hygiene, aseptic technique and the use of Personal Protective Equipment (PPE) reduce cross-transmission of antimicrobial resistant pathogens. Clear specification of aseptic technique relating to infusates will help negate contamination risk. Where nurses feel they have limitations or concerns regarding their practice, they need to address it with the necessary further training.

Intravenous devices provide direct entry for microorganisms into the bloodstream, and infection related to intravenous devices is an important cause of morbidity and mortality. Good practice in IV therapy is vital and nurses have a key role in the prevention of infection associated with IV devices. Nurses must understand why their patients have IV devices, and when the device is no longer needed they need to ensure that it is removed. Meticulous attention to asepsis is essential in all aspects of IV care, and nurses' having a greater awareness of the part that they play in the prevention of catheter related blood stream infections is essential. The range and depth of knowledge required by an individual nurse will depend upon the scope of their individual practice (Scales, 2008).

A working knowledge of local policy and guidance will provide continuity and standardization at ward level, and this has been recommended as good practice (Pratt et al 2007). Failure to maintain professional knowledge and competence, or to identify and minimize risks to patients in relation to aseptic technique, could be viewed as a

failure to meet the necessary nursing standards. Therefore, good aseptic practice needs to be part of every nurse's practice when dealing with IV medications.

A readily available policy and care documentation system for nurses involved in peripheral IV cannula insertion will support nurses. Also regularly updating nurse's knowledge in peripheral IV preparation, administration and management as well as regular auditing of aseptic techniques and identifying shortcomings will help nurses to be able to provide current research evidence based care. Such strategies will promote nurses' to take responsibility of the problems identified in their practice and improve the standard of aseptic technique performance.

Every patient should be considered as susceptible to nosocomial infection as such infection control standards and safe competent practice is the goal when dealing with the IV therapy. Improving the safety of patient care in IV therapy requires systems to identify and manage actual and potential risks to patient safety. These systems require actions in performance improvement, documentation, education, environmental safety, and risk management, including infection control, equipment safety, safe clinical practice, and safe environment of care. This initiation requires all healthcare practitioners' involvement since patient's safety is vital.

Doctors are responsible for the insertion of peripheral IV catheters and they decide when a catheter is to be removed. It is therefore difficult to ascertain whether full compliance with guidelines and a reduced infection rate can be achieved if nurses are given full control over the IV procedure.

The standardization of practice in areas of care where patients are at increased risk of infection and set national guidelines will help reduce the risk of HAIs and maintain safe evidence-based practice so that nurses do not unwittingly cause harm to their patients. A policy of feedback to clinical teams regarding the number of Catheter Related Blood Stream Infections (CRBSI) episodes and overall rates will help abreast them with the risk at hand.

One aspect that needs further studies is the interval replacement of IV administration set and fluid if no complications occur, many studies have examined the interval replacement of IV administration set and data revealed that replacing administration

sets within 72-96 hours is safe and cost-effective (Trim 2005:658), others within 48-72 hours (Aziz 2009:244).

There is also conflicting evidence as to which dressing should be used to protect IV catheter insertion sites. Transparent dressings have been widely used over the years, but there is increasing concern about the safety of these dressings throughout the review.

Throughout this final project work, we have realized that IV therapy is an important part of any clinical setting. Hospital acquired infections in theory have been accepted as an important and necessary concept in most hospitals worldwide but in practice the principles involved in its control are conspicuously missing or absent. We recommend that emphasis is placed on the importance of educating nurses who undertake peripheral IV preparation, administration and management especially on the need to use maximal sterile barrier precautions during peripheral IV care, the need to apply the principles of asepsis on insertion and handling the catheter and administration sets as well as performance improvement indicators to monitor the success of the above recommendations.

As Ingram and Lavery (2005:55) put it: "all nurses involved in peripheral IV therapy have a role to play in the prevention and containment infection" though insertion of a cannula is done mostly by the physician, its care is the sole responsibility of the nurse. We recommend that all nurses use risk-assessment protocols, attend educational updates, and conduct regular audits in their practice areas. This will not only have benefits in promoting the safety and wellbeing of the patients, but also provide a safe environment for nurses to learn and practice these skills in a safe and competent manner. Also further studies be done in this area of asepsis such that there is clearly set standards of practice to help reduce infection risk.

All health care practitioners and nurses in particular involved in IV therapy must deliver care based on the best available evidence or best practice, and knowledge and skills for safe and effective practice must be kept up-to-date throughout each practitioner's working life, thus each practitioner must follow robust standard of IV practice and adhere to hand hygiene, aseptic technique and the use of personnel protective equipment at all times.

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Database Search Results

KEYWORDS	EBSCO-CINAHL			OVID (Medline)			PUBMED	
	Hits	Relevant Articles	Articles selected	Hits	Relevant Articles	Articles selected	Hits	Relevant Articles
Intravenous therapy AND asepsis	5	2	1*	44	3	1*	2	0
Aseptic Technique AND IV Therapy	2	1	1	472	2	1	4	0
Antisepsis AND IV Therapy AND antibiotic	4	0	0	0	0	0	0	0
Infection control AND IV Therapy	9	8	5(3)*	10	6	3*	67	0
IV Medication	10	1	0	72	6	0	434	0
Total	30	12	7(4)*	598	17	5(4)*	507	0

*Duplicate



Total: 7+1=8

Articles and Sources

No	Author	Year	Country	Journal	Method of acquiring	Title
1	Aziz, A, M	2009	UK	British Journal of Nursing	CINAHL	Improving peripheral IV cannula care: Implementing High impact Interventions
2	Curran, E	2011	UK	British Journal of Nursing	Reference Article	Intravenous drug preparation: the infection risks
3	Hart, S.	2007	UK	Nursing Standard	OVID	Using an aseptic technique to reduce the risk of infection
4	Ingram P, and Murdoch, M.,F.	2009	U.K	Nursing Standard.	CINAHL/OVID	Aseptic non-touch technique in intravenous therapy
5	Ingram, P. and Lavery, I.	2005	U.K	Nursing Standard	CINAHL/OVID	Peripheral intravenous therapy: key risks and implications for practice
6	Lavery, I.	2010	U.K	British Journal of Nursing	CINAHL/OVID	Infection control in IV therapy: a review of the chain of infection
7	Lavery I, & Ingram P.	2006	U.K	Nursing Standard	CINAHL	Prevention of infection in peripheral intravenous devices
8	Morris, W. and Tay, M., H.	2008	U.K	British Journal of Nursing	Reference Article	Strategies for preventing peripheral intravenous cannula infection
9	Rowley, S. Clare, S Macqueen, S., and Molyneux, R.	2010	UK	British Journal of Nursing	CINAHL	ANTT v2: An updated practice framework for aseptic technique
10	Scales, K.	2008	U.K	British Journal of Nursing	CINAHL	Intravenous therapy: a guide to good practice
11	Trim, J., C.	2005	U.K	British Journal of Nursing	Reference Article	Peripheral intravenous catheters: considerations in theory and practice

Synthesis of the Articles

Author, title and source	Purpose and study question.	Sample/ Settings	Type of study	Data collection and analysis	Main findings
<p>Aziz, A.M. (2009) Improving peripheral IV cannula care: implementing high-impact interventions. <i>British Journal of Nursing</i> 18(20), 242-246</p>	<p>Discusses the care required for peripheral cannulas and shows how implementing the high-impact interventions can improve peripheral IV catheter care on insertion and its management afterwards.</p>	<p>University Hospital of South Manchester NHS Foundation Trust (UHSM)</p>	<p>Interventional study</p>	<p>Observational tool was used to monitor both the insertion and ongoing care of the peripheral IV catheter. The feedback of the results is given to help identify areas where improvement is needed.</p>	<p>The study highlighted the essential elements of carrying out a particular procedure that must be applied every time to reduce the risk to the patient. The high impact intervention outlined the following as important elements for insertion of peripheral IV catheter: protective hand hygiene, equipment, skin preparation, dressing and documentation. Elements for the ongoing care of the peripheral iv catheter were as follows: hand hygiene, documentation, site inspection, dressing, cannula access, administration set replacement and routine cannula replacement. Common elements not met were the wearing of Personal Protective Equipment (PPE) particularly gloves, as certain healthcare workers find it difficult to wear gloves when cannulating and due to the busy climate of the hospital, documenting the cannulation has been forgotten. Moreover, attention also needs to be paid to the timely removal of peripheral IV cannulas and continuous education of all clinical staff around peripheral IV catheter care.</p>

<p>Curran, E. (2011) Intravenous drug preparation: the infection risks. <i>British Journal of Nursing</i> 20(14), 4-8.</p>	<p>Explores the literature around infusate contamination, as well as the types of microorganisms that cause contamination and the types of drugs that enable proliferation of microorganisms.</p>	<p>Not applicable</p>	<p>Literature Review</p>		<p>Evidence from outbreak reports, prospective evaluations of infusates and procedure observations combined indicated that, presently the risk of infusate related blood stream infections has been under-recognized. Although gram-positive microorganisms such as <i>Staphylococci spp</i> are the main cause of catheter-related bloodstream infections and can contaminate infusates, they are implicated less because of their inability to grow rapidly in the infusates. Despite the fact that any drug can become contaminated, infusate-related bloodstream infections is most frequently reported in association with lipid-based drugs (e.g. propofol) and heparin. There is the need to recognize the sources of infusate contamination and the risk of infusate related blood stream infection</p>
<p>Hart, S. (2007) Using an aseptic technique to reduce the risk of infection. <i>Nursing Standard</i> 21(47), 43-48.</p>	<p>Outlines how handwashing continues to be the most important factor in reducing healthcare-associated infection, but that the use of an aseptic technique will further cut the risk of infection.</p>	<p>Not applicable</p>	<p>Literature Review</p>		<p>Healthcare-associated infections put patients at significant risk of morbidity and mortality. This article also discussed the infection control requirements that are an essential part of aseptic non-touch technique and provided information to guide nurses when undertaking aseptic technique, which involves ensuring that, consent is received from patients and that they are adequately prepared. The environment and equipment are</p>

					prepared. Handwashing takes place. Disinfection and sterilization are undertaken. Personal protective equipment used.
Ingram, P. and Murdoch, M.F. (2009) Aseptic non-touch technique in intravenous therapy. <i>Nursing Standard</i> 24(8), 49-57.	Describe the principles of surgical aseptic technique and aseptic non-touch technique in relation to intravenous therapy, as well as discussing the nurse's role and responsibilities in carrying out the procedure effectively.	Not applicable	Literature Review		The findings in this study outlines and explains ways to achieve aseptic non-touch technique in IV management which includes, Preparation of the environment, carrying out a risk assessment, hand hygiene, personnel protective equipment, equipment, patient preparation and safe technique. It was also recommended that education must involve an approved educational session followed by practical competency in aseptic non-touch technique to ensure correct application of the procedure. In case nurses feel they have limitations or concerns regarding their practice this should be addressed with further training where necessary. Regular audits of practice should be performance to safeguard patient. The common breaches while employing aseptic non-touch technique were during cannula insertion, IV medication preparation and administration, changing dressing on the device and removal of the device.
Ingram, P. and Lavery, I. (2005) Peripheral intravenous therapy: key risks and implications for	Plan to review the key risks of peripheral intravenous therapy by reviewing risk analysis	Not applicable	Literature Review		Support for staff nurses is essential, they should be appropriately trained and knowledgeable of their practice area and medicines. Thus, it is imperative that

<p>practice. <i>Nursing Standard</i> 19(46), 55-64.</p>	<p>relating to peripheral intravenous therapy, identifying measures to reduce risks and the nurse's role in peripheral intravenous therapy. And offers recommendations for practice, with the aim of reducing the associated risks</p>				<p>they complete a competency based training program and up-to-date information. Registered nurse undertaking peripheral IV therapy to self-assess his or her competence every three months. This ensures the maintenance of skills and addresses any limitations related to professional accountability. The environment in which the injections are prepared must be risk assessed, whether it has adequate lighting, ventilation, enough space and the ability to work uninterrupted. Medicine manufacturers have a role to play, by using consistent, standardized and clear labeling to reduce risks associated with peripheral IV therapy. Adherence to robust aseptic technique, the use of personal protective equipment and hand hygiene are essential in safer patient care and practice.</p>
<p>Lavery, I. (2010) Infection control in IV therapy: a review of the chain of infection. <i>British Journal of Nursing</i> 19(19), S6-S14.</p>	<p>Aims to review the principles of infection control relating to intravenous therapy using the chain of infection as a framework to review the standards of practice.</p>	<p>Not applicable</p>	<p>Literature Review</p>		<p>Reviews the components of the chain of infection and outlines suggestion to control infections during each stage in the infection sequence. The infectious agent may come from the patient's skin during initial cannulation insertion through the hands of the health worker, and during manipulation of the iv hub. The cannula may not be well secured which will allow cannula movement leading to risk of mechanical phlebitis.</p>

					<p>Recommendations such as clean environment for preparation and administration , appropriate inspection of package, reservoir and storage of equipment and patient education were good measures to reduce infection at the infectious agent and reservoir stage. In addition, compliance with hand hygiene, ANTT, PPE, effective skin Preparation, proper cannula material, cannula changing time regular site monitoring and appropriate cleansing were recommended to reduce infection at the means of transmission and portal of exit stage. Strict aseptic technique during manipulation of the hubs was a measure to reduce infection at the portal of entry stage. Practitioner's knowledge and skills must also be kept up-to-date throughout each practitioner's working life. Furthermore, the chain of infection must be reviewed to ensure safe practice.</p>
<p>Lavery, I. and Ingram, P. (2006) Prevention of infection in peripheral intravenous devices. <i>Nursing Standard</i> 20(49), 49-56.</p>	<p>Focuses on good practice in preventing infection in peripheral intravenous devices, identifying the risks of infection by explaining the chain of infection and the nurse's role and responsibilities.</p>	<p>Not applicable</p>	<p>Literature Review</p>		<p>The chain of infection was discussed as comprising of six links described sequentially as the infectious agent, the reservoir, portal of exit, means of transmission, portal of entry, susceptible host. For infection to occur, each component in the cycle must be present in sequential order starting with the infectious agent. During the first stage in the chain, the source of infection can be</p>

					<p>either from the patient or the health worker. Breaking the chain at this stage will involve appropriate patient education and compliance with aseptic technique by health personnel. A clean environment and equipment for undertaking a procedure was recommended to break the chain at the reservoir point(stage 2), compliance and skills in hand hygiene were essential to break the chain at the portal of exit stage(stage 3). The 4th stage is known to be the easiest stage to break in the chain, the use of protective devices, appropriate hand hygiene and strict aseptic technique are essential at this point in the chain. Regular device, assessment, cleaning of ports and hubs before use, and removal of cannulas after 72-96 hours or sooner if complications occur were suggested to help reduce infection at the 5th stage</p> <p>It is essential that tough aseptic techniques, skillful insertion and monitoring of the device, adherence to personal protective equipment, thorough handwashing and keeping accessible records are always implemented to reduce the risks of infection.</p>
Morris, W. and Tay, M.H. (2008) Strategies for preventing peripheral intravenous	Examines the nursing management strategy used by the North Bristol NHS Trust for preventing	North Bristol NHS Trust	Literature Review		Good practice principles for preventing infections when performing peripheral IV cannulation includes appropriate hand hygiene before collecting equipment,

<p>cannula infection. <i>British Journal of Nursing (IV therapy supplement)</i> 17(SUPPL.19), S15-21.</p>	<p>infection when performing peripheral IV cannulation. Discusses the sources and routes of infection associated with peripheral IV cannulation and examines health care management strategies for preventing infections when performing peripheral cannulation.</p>				<p>palpating the veins and before placing gloves on hands and repeating after removal of gloves cannula and during ongoing care of the cannula. Decontamination of the proposed cannula site with at least 0.5%chlorhexidine gluconate in 70%isoprophyl alcohol, and leaving the site to dry for 30 seconds, using universal infection control precautions throughout the procedure. Applying sterile semipermeable dressing to hold the cannula firmly in place. Exposing the cannula site or making it clearly visible, documenting the insertion of the cannula and maintaining accurate record demonstrating ongoing cannula care. Practitioners must be supported by a policy on peripheral intravenous insertion and care and a documentation system. Policy must be audited and results of the audit will be used to informed staff of current practice. Additionally, practitioners must be able to access education and training to ensure adherence to cannulation procedures.</p>
<p>Rowley, S. et al. (2010) ANTT v2: an updated practice framework for aseptic technique. <i>British Journal of Nursing</i> 19(SUPPL. 5), S5-S11.</p>	<p>ANTT v2 introduces the theory and consolidates the practice of using micro aseptic fields to protect key parts to reflect current practice and reduce</p>	<p>Not applicable</p>	<p>Literature Review</p>		<p>ANTT v2 recommends the ideal aseptic environment for key parts afforded by micro aseptic fields. That key parts must only come into contact with other aseptic key-parts or key-sites. key parts were explained as the aseptic parts of the</p>

	unnecessary complications.				<p>procedure equipment that need to have direct contact with the aseptic key parts of the patient, key sites or any liquid infusion</p> <p>It was recommended that in case key parts are to be touched directly, sterile gloves should be used instead of the non-sterile gloves. Procedures are risk assessed, taking into account the technical difficulty of the procedure, the competence of the practitioner and the immediate physical and air environment.</p>
<p>Scales, K. (2008) Intravenous therapy: a guide to good practice. <i>British Journal of Nursing</i> 17(SUPPL. 19), S4-S12.</p>	<p>Provides an overview of the principles of good practice in intravenous therapy and addresses the issues associated with general intravenous therapy and provides an opportunity for nurses to standardize their IV practice against the recommendation made.</p>	Not applicable	Literature Review		<p>The findings revealed that good practices in peripheral IV cannula management involve: proper selection of the vein e.g. a vein that is not over a joint, the use of a safety cannula. Proper cleansing of the skin with an appropriate cleansing agent e.g. 2%chlorhexidine in 70% isoprophyl. And allowing it to dry before cannulation. Decontamination of the device before giving medicines or manipulating the equipment. Changing of the cannula every 72 hours or as needed. Avoiding peripheral administration of irritants and continuous vesicant therapy. Removing catheter when not needed. Good practices to reduce infection included: proper hand washing, the use of gloves and the use of aseptic technique during preparation administration and site care. Labeling of IV containers and</p>

					administration sets with the appropriate date and time opened and changing them appropriately. Proper decontamination of administration ports, replacement of dressing when necessary and removal of the device when no longer in use and site monitoring using a tool.
Trim, J.C. (2005) Peripheral intravenous catheters: considerations in theory and practice. <i>British Journal of Nursing</i> 14(12), 654-658.	Aims to discuss both theoretical and practical factors, to assist healthcare professionals to undertake cannulation with confidence and competence.	Not applicable	Literature Review		IV peripheral catheters should be resited every 48-72 hours but maybe left up to 96 hours if there are no complications. Aseptic technique should be used when removing the catheter and steady movement should be used to prevent a haematoma developing. Nurses who undertake cannulation must understand the importance of gaining informed consent from patients. A hospital policy may also establish the expected method of training, supervised practice and competence, which encourages research-based standardized practice and provides guidance as well as documentation for evidence of competence.

Themes based on preparation, administration and management

Preparation	administration	Management.
<p>Patients should be given the appropriate education (e.g. on the need to keep the insertion site sterile, symptoms to report for further assessment, i.e. report any swelling, redness, tenderness, drainage, shoulder pain, or chest discomfort) (Ingram & Murdoch 2009:53; Lavery 2010:S8; Lavery & Ingram 2006:53) as well empowered to take responsibility of their care including knowing the signs and symptoms of early signs of infection (Aziz 2009:246; Lavery & Ingram 2006:53; Trim 2005:558).</p> <p>Consent should be sought from the patient and patients given comprehensive explanation of the procedure, or its indications and contraindications (Ingram & Murdoch 2009:53; Hart 2007:44; Trim 2005:654).</p> <p>The environment where the IV medication procedure is going to take place should be identified, designated and clean (Ingram & Lavery 2005:59; Lavery 2010:S8; Ingram & Murdoch 2009:51; Hart 2007:44; Curran 2011:S7; Scales 2008:S10). These include ensuring that at least 30mins has elapsed after bedmaking/domestic cleaning has finished (Ingram & Murdoch 2009:51) and the health professional should be able to work uninterrupted (Ingram & Lavery 2005:56).</p>	<p>Practitioners must avoid wearing wristwatches, stoned rings, long fingernails and long sleeves when in clinical areas as they interfere with hand decontamination (Morris & Tay 2008:S17).</p> <p>Health workers must adhere to hand hygiene throughout the cannula care according to local/hospital policy (Lavery 2010:S8; Hart 2007:46; Ingram & Murdoch 2009:52; Ingram & Lavery 2005:60, Lavery & Ingram 2006:51; Morris & Tay 2008:S21; Rowley, Clare, Macqueen & Molyneux 2010:S8; Scales 2008:S10; Aziz 2009:244; Curran 2011:S7; Trim 2005:656).</p> <p>To improve compliance with hand hygiene healthcare practitioners are encouraged to challenge poor hand hygiene practices (Morris & Tay 2008:S17).</p> <p>Apply aseptic technique when preparing, administering and all further manipulations of the IV system to reduce infection (Ingram & Lavery 2005:59, Curran 2005:S7).</p> <p>Aseptic non- touch technique should be employed to ensure key parts are kept sterile (Ingram & Murdoch 2009:53; Lavery 2010:S14; Rowley, Clare,</p>	<p>Thorough assessment, planning and skillful insertion of the device, ongoing regular monitoring (Lavery 2010: S10; Morris & Tay 2008:S21), maintenance and keeping accessible records will help reduce infection risk (Lavery & Ingram 2006:56).</p> <p>Transparent dressing should be used because it permit continuous visual inspection of the catheter insertion site (Morris & Tay 2008:S21; Aziz 2009:244; for any signs of phlebitis.</p> <p>The dressing should be well-secured to prevent movement of the cannula, which would increase the risk of carrying micro-organism from the skin, or causing infiltration or extravasation of drugs or fluids (Lavery & Ingram 2006:53;Trim 2005:657).</p> <p>Dressing changes require an aseptic non-touch technique (Scales 2008:S5). dressings should be replaced when loose, wet or soiled and site monitored using a phlebitis scoring tool (Scales 2008:S5).</p> <p>Needleless devices should replace the use of bungs to maintain a closed IV system (Scales</p>

<p>All equipment should be stored in a dry, clean and safe place (Lavery 2010:S8; Ingram & Lavery 2005:59; Hart 2007:44).</p> <p>The health worker must make a risk assessment to determine appropriate hand hygiene method and solution (Hart 2007:44; Ingram & Lavery 2005:60; Ingram & Murdoch 2009:52; Ingram & Lavery 2005; Lavery & Ingram 2006:52; Morris & Tay 2008:S21).</p> <p>Cuts or broken skins should be covered with waterproof dressing (Hart 2007:46).</p> <p>Decontaminate hands correctly before collecting equipment, palpating the veins, cannulation, and placing gloves on hand, and repeat after removing gloves (Morris & Tay 2008:S21) and immediately before and after contact with patients (Lavery 2010:S8, Hart 2007:44; Morris & Tay 2008:S21; Aziz 2009:244; Lavery & Ingram 2006:52).</p> <p>The use of alcohol handrubs should be encourage where there are no hand washing facilities, and should be promoted for all members of the healthcare team, patients and visitors (Lavery & Ingram 2006:51).</p> <p>Lower extremities, joints or nerves should be avoided when siting the cannula (Ingram & Lavery 2005:60; Scale 2008:S5). The number of attempts for cannulation should be reduced as increased puncture sites increases the risk of infection (Ingram & Lavery</p>	<p>Macqueen & Molyneux 2010:S9; Scale 2008:S10)</p> <p>The use of personal protective clothing (gloves, apron and eye/face protection) must be based on a risk assessment (Lavery 2010:S14; Aziz 2009:244; Morris & Tay 2008:S18; Hart 2007:45).</p> <p>If the health care worker feels that during the procedure they may come into contact with blood or body fluids, then the appropriate protective clothing must be worn to prevent cross-infection (Lavery & Ingram 2006:52; Ingram & Lavery 2005:57;Ingram & Murdoch 2009:51).</p> <p>Use 2% chlorhexidine and 70% alcohol and allow it to dry prior to accessing the cannula for administration of fluids injections(Scales 2008:S5 Aziz 2009:244).</p> <p>Ensure that IV fluids are labeled with the date the time they are opened(Scales 2008:S10)</p>	<p>2008:S10).</p> <p>Health professionals should ensure all IV administration sets are labeled with the date and time they are opened and changed appropriately: solution sets - change at 72 hours; blood sets- change at 12 hours; lipid-containing solutions – change at 24 hours (Scales 2008:S:10).</p> <p>Add-on devices should be kept to a minimum and changed as recommended by the manufacturer.(Scales 2008:S10).</p> <p>In general, 3-way taps should be changed every 72 hours, bungs (single use, or changed at 72 hours if not removed from device), and needleless devices should be changed according to manufacturers' instructions (Aziz 2009: 244; Scales, 2008:S10, Lavery & Ingram 2006:54).</p> <p>Administration sets that are disconnected should be discarded (Scales 2008:S10) and nurses must understand the care and management of the devices used in their practice area (Lavery & Ingram, 2006:S4).</p> <p>To reduce the discomfort, the risk of phlebitis and catheter-related infection, peripheral catheters sites are replaced at 72 hour intervals. Though other studies (Aziz</p>
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2005:60).

If the skin is visibly dirty, the site should be washed with soap and water (Ingram & Murdoch 2009:53; Trim 2005:657) and when the skin is visibly clean, prepare the skin with 2% chlorhexidine in 70% isopropanol alcohol and leave the site to dry for at least 30 seconds (as per local policy) (Lavery 2010:S12; Aziz 2009:244; Trim, 2005:657; Ingram & Murdoch 2009:53; Scales 2008:S5; Lavery & Ingram 2006:53; Wendy & Tay 2008:S16) starting at the insertion site and working outwards using a back and forth motion (Ingram & Murdoch 2009:53)

2009:244; Lavery & Ingram 2006:54) recommended replacing in a new site after 72-96 hours or earlier if indicated clinically.

During IV therapy the use peripheral cannula care plan to aid in regular monitoring and record keeping (Morris & Tay 2008:S19; Aziz 2009:244; Lavery & Ingram 2006:56).

Documentation should include the insertion of the cannula and accurate record demonstrating ongoing cannula care (Morris & Tay 2008:S21; Aziz 2009:244). Also IV equipment and fluid containers should be labeled with date and time they are opened to ensure they are changed appropriately (Scales 2008:S10).

Apply aseptic technique when preparing, administering and all further manipulations of the IV system to reduce infection (Ingram & Lavery 2005:59, Curran 2005:S7).

Dressings should be replaced when wet loose or soiled (Scales 2008:S10).

Administration sets that are disconnected should be discarded (Scales 2008:S10).

Record peripheral cannula insertion on patient's records or on cannula tool (Aziz

		<p>2009:244).</p> <p>Adherence to hand hygiene throughout the cannula care.)Lavery 2010:S8; Hart 2007:46; Ingram & Murdoch 2009:52; Ingram & Lavery 2005:60, Lavery & Ingram 2006:52; Morris & Tay 2008:S21; Rowley, Clare, Macqueen & Molyneux 2010:S8; Scales 2008:S10; Aziz 2009:244; Curran 2011:S7; Trim 2005:656)</p>
<p>A risk assessment must be done before the procedure to help protect key parts and key sites (Ingram & Murdoch 2009:52; Ingram & Lavery 2005:58; Morris & Tay 2008:S18).</p> <p>Before using/opening the package, the nurse must ensure that it is intact and up to date (Hart 2007:44; Ingram & Murdoch 2009:53; Ingram & Lavery 2005:59; Lavery & Ingram 2006:51).</p> <p>Health care professionals should comply with aseptic technique when opening package (Lavery & Ingram 2006:51-52) and when preparing medication (Ingram & Lavery 2005:57; Curran 2011:S7).</p>		