
Intravenous Therapy

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Foreword

Health care has benefited from a lengthy relationship with intravenous therapy throughout recent centuries. In fact, intravenous therapy continues to play a central role in the delivery of many modern day investigations and treatments. Therefore, it is of no surprise that this book has been written, but readers may ponder on the timing of such a publication. The answer is simple; in the world of intravenous therapy we are at a point of tumultuous transition. A period of development and change that can only strengthen the nursing contribution to intravenous therapy.

It is only in recent years that we have seen an increase in the nursing contribution to intravenous therapy. These changes have coincided with an abundance of national initiatives such as the scope of professional practice, the publication of numerous national guidelines related to intravenous therapy, including blood transfusion and central venous catheter care, and the development of vascular access teams. Developments over the last two decades have seen skills associated with intravenous therapy being merged with the long list of essential skills for registered nurses. Whether the issues are geographical, professional or skills-based, intravenous therapy holds no boundaries. Teresa Finlay has brought this philosophy together into one easy-to-read text. It may be presented as a beginner's guide, but the combination of practicality and essential information should ensure a place for this text on any practitioner's bookshelf.

In my daily practice I meet nurses who are often faced with the riddles and complexities of intravenous therapy. This essential guide will be an invaluable resource.

Teresa begins her book with an overview of role expansion, answering those often asked questions related to certification, moving between organisations and supervised practice, to name but a few.

Chapter 2 clearly integrates related anatomy and physiology, access devices and their potential effect upon the body, demonstrating how the integrity of normal structures can be disrupted during intravenous therapy. The most compelling component of Chapter 3 is the philosophy that demonstrates that even if you have not inserted a vascular access device or you are not administering intravenous medication, you still need to be aware of the device and how your patient should be cared for with such a device in place. Together, Chapters 4, 5 and 6 deliver an impressive practical guide that ranges from the reconstitution of medication, through the topics of fluid balance, blood component therapy and parenteral nutrition. It concludes with an essential guide to pharmacology and drug calculations.

Working within a specialised area of practice such as infusion therapy, I am often fearful that intravenous care may degenerate into nothing more than a collection of tasks. Within this guide, Teresa has encompassed the range and diversity of skills and knowledge required as a foundation for the delivery of safe, integrated, corroborated, effective and reliable patient-centred intravenous care.

Andrew Jackson
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Preface

Intravenous (IV) therapy is becoming ubiquitous in health care, impacting on nurses, midwives and many other health care professionals' daily practice. The administration of infusions or drugs and the care of venous access devices are routine aspects of patient care. It is not acceptable that patients should suffer avoidable injuries from thrombophlebitis, infiltration or extravasation, and standards of practice are subject to scrutiny and are increasingly being questioned by patients. To this end it is clear that all practitioners involved in caring for patients with IV access and receiving IV therapy should have the knowledge and skills to enable them to deliver the highest standards of care to their patients.

Currently there is no national standard for IV therapy practice or education. Policy and training are locally agreed and delivered with variation nationally. Since the advent of clinical governance and evidence-based practice this is no longer satisfactory, and a nationally recognised programme of education needs to be adopted. The Royal College of Nursing (RCN) Intravenous Therapy Forum is working to develop a national standard based on guidelines developed by the Infusion Nurses Society in the United States of America. In addition, the emergence of expert practice and nurse consultant roles in practice areas directly relating to IV therapy is driving the change and development in IV therapy practice nationally.

The principles covered by this book aim to fulfil the RCN IV Therapy Forum standards and provide an essential grounding for good practice to support practitioners' knowledge development prior to gaining or updating practical experience and competence. The first chapter of the book covers issues relating to competence and practising with accountability. In the light of the rising numbers of errors in drug administration and increasing litigation, the importance of

understanding legal and professional issues cannot be underestimated. Fluid and electrolyte balance and circulatory anatomy and physiology inform decision-making in IV therapy and are addressed in Chapter 2, drawing on examples directly associated with IV therapy practice. In addition, the implications of different types of IV access are introduced. Chapter 3 considers the devices which are used to gain IV access, their characteristics, uses and the care of patients having a device inserted, or with one in place. Practical, step-wise information about administering drugs and infusions is covered in Chapter 4 with examples of common practice situations and how to approach them. Chapter 5 covers infusion fluid therapy including blood and blood product transfusion, with information on different fluid types, when they are used and how they should be stored and administered. This includes parenteral nutrition though it is clear that this text is not comprehensive, and additional resources should be sought to develop skills in this area. Finally, the pharmacological aspects of IV therapy are considered in Chapter 6. General information about pharmacokinetics and pharmacodynamics precedes material about the effects of different methods and timing of administering IV therapy and details of resources for information about drugs and their administration. Calculation formulae are described with examples of calculations commonly undertaken in practice and there are test questions with answers for practice. Each chapter directs the reader to its contents, with clear summary points to conclude. In addition, useful resources for information are listed at the end of each chapter to enable further exploration of the topic as desired.

In aiming to provide a textbook covering all the fundamental aspects of knowledge required for IV therapy practice, the book does not seek to provide comprehensive information on all areas related to the subject. It is anticipated that readers are learning or refreshing their knowledge about the fundamental aspects of IV therapy before going on to build on or adapt them to their specialist areas of practice. For this reason the book does not cover cytotoxic chemotherapy administration, specialist issues related to paediatric IV therapy, community IV therapy or venepuncture and cannulation. There are other texts that cover these issues comprehensively and within the

framework of more specialist knowledge specific to that area of practice.

The use of the term health care professional in the text refers to any qualified, registered practitioner in health care. The abbreviation IV is used to mean either intravenous or intravenously depending on the context. All the scenarios detailed in the text are fictitious and do not intentionally bear any resemblance to actual people or events.

It is hoped that this book will be adopted to provide new health care professionals with a good fundamental knowledge of the principles of IV therapy from which to develop safe, evidence-based practice for their patients.

Teresa Finlay
Oxford 2003

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- the patients;
- the intravenous therapy team at the Royal Marsden Hospital, and Val Speechley, who collectively awakened my interest in IV therapy practice;
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- Jill Kayley, Community IV Therapy Specialist Nurse;
- Sarah Blackburn, pharmacist;
- James Walthall;
- my colleagues and students;
- my family and friends;
- my partner Bob.

I would like to dedicate the book to my grandparents George and Isa Jervie, who were pharmacists; my grandmother has taken a keen interest in the progress of the project despite the major changes in practice since my grandparents' dispensing days.

Expanding Practice in IV Therapy

1

INTRODUCTION

With broadening responsibilities in health care and the recognised need for evidence-based practice, practitioners must have a working understanding of the professional and legal implications of their actions in advance of developing their practice. This is true for those involved in giving patients IV therapy, particularly as this aspect of care is potentially highly dangerous, but is becoming more relevant to almost all areas of practice. This chapter considers:

- ❑ competence; how to gain, develop and maintain competence in IV therapy;
- ❑ accountability; the issues of authority and autonomy and the legal implications of practising with accountability;
- ❑ evidence-based practice (EBP); the need for knowledge and the relationship of EBP to accountability.

COMPETENCE

Health care professionals (HCPs) involved in IV therapy have a duty to provide a reliable, safe standard of care to patients in a competent, skilled manner. In order to do so there are several steps to take to achieve competence (see Fig. 1.1).

Knowledge

It is essential that practitioners first develop (or update) a firm knowledge of:

- accountability;
- circulatory anatomy and physiology;

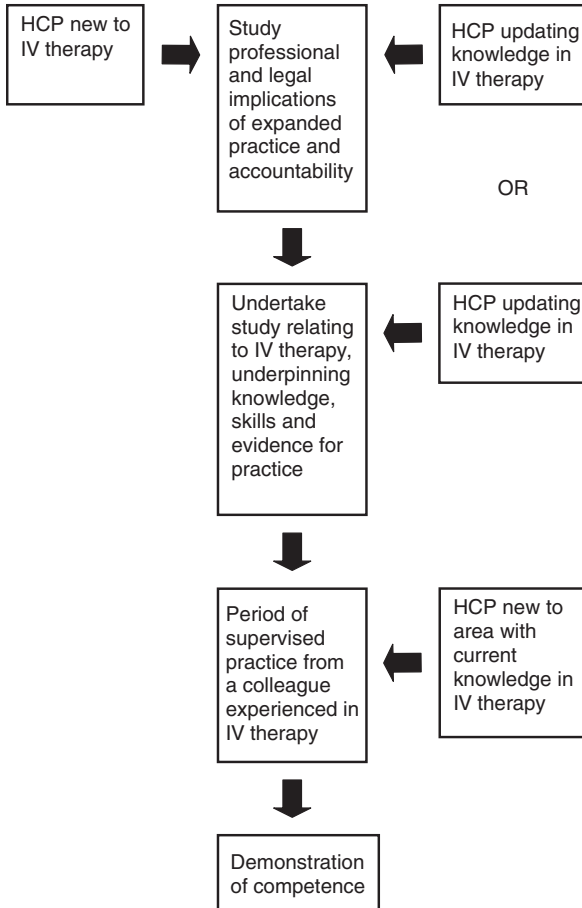


Fig. 1.1 Pathway to achieving or demonstrating competence in IV therapy administration

- fluid and electrolyte balance;
- techniques and equipment for IV therapy administration;
- pharmacology;
- administration of fluids, blood and blood products;
- risk management specifically relating to IV therapy;
- the possible effects of treatment on the patient, physically, socially and psychologically.

Knowledge is usually gained partly from studying these principles using learning packs or attending study sessions or a combination of both. Additionally, understanding of these principles is gained and reinforced by working with experienced colleagues.

Certificates

Having completed a period of study, most health care professionals are pleased to receive a certificate. The certificate constitutes evidence of attendance on the programme of study, and should be kept in the practitioner's portfolio. It is important to realise that this is no demonstration of ability. The practitioner's skill lies in their ability to apply the knowledge gained to practise and develop their competence in IV therapy.

Developing competence

Supervised practice

Having gained knowledge in the aspects detailed above, novice health care professionals should practise administering IV therapy in their clinical area with the supervision of a competent, more experienced colleague. This person is usually identified by the senior practitioner or the manager responsible for practice in that clinical area. The period of supervision is likely to vary from one practitioner to another. The aim is for the novice practitioner to develop competence in IV therapy with the guidance, facilitation and support of their supervisor.

Assessment

After a period of supervised practice both the novice and the supervisor should agree that the practitioner has demonstrated competence in administering drugs intravenously in their area of clinical practice. It is recommended that this is not assessed on a single occasion but over a period of time. 'One-off' assessments do not necessarily indicate competence. Drivers with valid driving licences gained at a single driving test do not necessarily drive safely! They did so only at the time of the test. Practitioners experienced in IV therapy, coming to a new clinical area may require a minimal period of supervision before it is agreed that they are competent to practise independently.

An example of clinical competences suitable for IV therapy is in Box 1.1 and such a form may be signed by both the practitioner and their supervisor. This form (copied to the manager for their records) will be retained by the practitioner for their

Box 1.1 Competences for IV drug administration

Elements of competence	Date and signature	
	Nurse	Supervisor
(1) Describes the rationale for administering drugs intravenously		
(2) Describes circumstances where it would be inappropriate to administer a drug intravenously, and alternative action to take		
(3) Describes the risks associated with intravenous drug administration		
(4) Demonstrates knowledge of the drugs routinely administered intravenously in that clinical area		
(5) Describes and/or diagnoses the signs and symptoms patients exhibit if a drug reaction occurs		

Elements of competence	Date and signature	
	Nurse	Supervisor
(6) Describes and/or takes the appropriate action in the event of a patient experiencing a drug reaction		
(7) Correctly calculates the doses, volumes and rates of drugs to be administered intravenously		
(8) Demonstrates appropriate techniques and actions in preparing drugs for administration intravenously		
(9) Demonstrates safe practice in the administration of prescribed intravenous medication		
(10) Demonstrates appropriate techniques in the administration of intravenous drugs as: <ul style="list-style-type: none"> • bolus injections • infusions over time 		
(11) Demonstrates health-promoting practice in caring for patients' intravenous access and administering drugs to patients		
(12) Describes how to act appropriately in the event of a drug error or adverse incident associated with administration of intravenous drugs		
(13) Demonstrates awareness of their professional accountability		
(14) Demonstrates knowledge of available resources relating to drug information, local policy and current evidence for practice		

professional portfolio, along with any completed learning packs and information from the study sessions relating to IV therapy, and a certificate of attendance. Together these items provide *evidence* of the practitioner's development, though it

is important to remember that though they support demonstration of competence, they do not prove it.

Updating knowledge and competence

Practitioners are responsible for keeping their knowledge and skills updated and may (as shown in Fig. 1.1) repeat study sessions about the legal and professional aspects of practice and IV therapy, or just those relating to IV therapy, depending on their needs and the provision of training available.

Moving to a different Trust

It has been the case that practitioners competent in IV therapy have been required to complete the whole process of study, supervision and assessment of competence when moving to a new Trust or health care institution. This is wasteful of time and resources, as well as indicating a lack of understanding and respect for professional practice. Whilst local policy should be followed for reasons of vicarious liability, practitioners who have evidence to support their practice should only have to demonstrate their knowledge and competence in order to give IV therapy. If, however, they have started working in a clinical environment unfamiliar to them, then there would be a case for undertaking specialised learning and a period of supervised practice in order to develop competence in giving different IV therapy to patients with different needs.

EXPANDED PRACTICE

Administering drugs to a patient intravenously has been considered to be an expanded practice role (for non-medical practitioners), or an additional area of practice for those who have not been taught these skills in their pre-registration course. This is despite the fact that approximately 80% of hospital patients receive some form of IV therapy, and an increasing number of patients in the community are treated with IV drugs or infusions (Dougherty 2000). The reason for this is that

IV drug administration was originally undertaken only by doctors. It is only in the last few decades that other health care professionals have started giving drugs IV. More recently some nursing pre-registration courses have included IV drug administration as part of the curriculum. For health care professionals who have not experienced this kind of education programme, IV therapy still constitutes an area of expanded practice, and expanding practice to undertake IV therapy should only be taken on by those who recognise this as beneficial to patient care, and for whom it is a requirement in their area of work.

For nurses, midwives and health visitors, expanded practice is supported by a code for practice laid down by their professional registering body – the Nursing and Midwifery Council (NMC) and stated in the Code of Professional Conduct (NMC 2002) (see Box 1.2). The expectation is that nurses keep

Box 1.2 The Code of Professional Conduct (NMC 2002)

- You must protect and support the health of individual patients
- You are answerable for your actions and omissions, regardless of advice or directions from another professional
- You have a duty of care to your patients, who are entitled to receive safe and competent care
- You must keep knowledge and skills up to date throughout your working life and take part regularly in learning activities that develop competence and performance
- You must possess the knowledge, skills and abilities required for lawful, safe and effective practice without direct supervision and acknowledge the limits of professional competence and only undertake practice and accept responsibilities for those activities in which you are competent
- If an aspect of practice is beyond your level of competence, you must obtain help and supervision from a competent practitioner until you and your employer consider that you have acquired the requisite knowledge and skill
- You have a responsibility to deliver care based on current evidence, best practice and, where applicable, validated research when it is available

patients' needs central to their decision-making, recognise their own level of competence and only take on aspects of practice for which they have current knowledge and skills and for which they can be accountable. There are similar expectations of practitioners in allied health professions (AHPs) as laid down in their respective codes of practice, and all are accountable for their practice.

ACCOUNTABILITY

Since the development of professional governing bodies such as the Nursing and Midwifery Council, the Radiographers Board and the Health Professions Council (for operating department practitioners and paramedics), health care professions have professionally and legally established practice that initiates and collaborates in patient care rather than merely following orders. In order to do this individual practitioners must be accountable for their practice. Essentially, accountability means being able to answer for actions taken or decisions made. Professionally this relates to the care given to patients in daily practice, whether giving IV drugs or any other aspect of care (Pennels 1997).

Authority and autonomy

To be accountable and to justify one's actions and decision-making, a health care professional must have the authority to act. Health care professionals automatically have this authority on registration as a qualified practitioner. This is on the basis of the education and training they received in order to gain registration. To be accountable, practitioners must also have autonomy. This means using one's judgement and acting on it so that practice can be defended or explained from the basis of knowledge rather than on the basis of tradition or myth. In other words, drawing up intravenous drugs as your colleague does 'because this is the way we do it here' is not acting autonomously. Drawing up the drugs in a safe manner based on available evidence and education is. Clearly, to prac-

tise with accountability, practitioners' knowledge must be maintained and updated. One cannot rely on what one learnt several years ago as the current knowledge for best practice. Neither inexperience nor ignorance of current practice in health care or the professional or legal issues involved in health care is an excuse for poor care or causing harm to a patient (Glover 1999). As can be seen from the development of accountable professions, carrying out orders from another professional is also no protection from liability if that causes harm to a patient (Dimond 2002) (see Box 1.3).

Legal aspects of accountability

Health care professionals are accountable in four areas in law (Dimond 2002). If a patient suffers any harm whilst receiving health care, then depending on the severity of the incident the professionals involved may be called to account in one or all of these areas (Table 1.1).

- (1) Accountability to the patient enables patients to trust the professionals caring for them and expect the professionals to practise accountably. A patient or their relatives may

Box 1.3 To take orders?

A staff nurse new to the ward is given a prescription for a patient by the Senior House Officer. This is for a large, intravenous dose of a drug with which she is unfamiliar. She tells the SHO she will need to query it with the on-call pharmacist and that she is unprepared to give the drug as prescribed. The SHO is angry and decides to give the drug herself. After the SHO has left the ward, the patient becomes gravely ill and subsequently dies.

If the nurse had given the drug, both she and the SHO would be liable for negligence. This would be because the SHO had prescribed it, and the nurse had given a drug she was not familiar with because she was ordered to. In refusing to give the drug the nurse was practising accountably and within the law.

Table 1.1 Areas of legal accountability (Dimond 2002)

Area	Aspect of law	Where cases are heard
(1) Patient	Civil law	Civil court
(2) Professional	Professional body's code of practice	Professional hearing by professional body
(3) Public	Civil or criminal law	Criminal court
(4) Employer	Contract of employment, employment law	Employment tribunal, disciplinary hearing in the workplace

have the right to sue the practitioner for negligence in the civil courts in the event of the patient suffering harm.

For negligence to occur three conditions must apply:

- the professional must owe the patient a duty of care;
- the duty of care must be breached;
- the patient must suffer harm as a result.

All registered professionals automatically owe patients a duty of care by means of their registration. For negligence to apply the professional must have acted in a manner that would not be supported by their professional body, that would breach their duty of care, and cause the patient harm (Dimond 2002). In the fictional example in Box 1.4 the staff nurse had breached his duty of care by incorrectly administering a drug infusion by the wrong (non-prescribed) route. Mr Ward's subsequent death clearly is the most extreme form of harm. Consequently Mr Ward's family would have a case for suing the staff nurse provided they could prove causation, because the people bringing the case are required to prove negligence. This could take the form of a personal action against the staff nurse in the civil court. Alternatively the family could sue the Trust employing the nurse (see Vicarious Liability below).

Box 1.4 A simple error?

Mr Ward was recovering from thoracic surgery. He had an epidural infusion of bupivacaine in situ and an intravenous patient-controlled analgesia infusion with morphine. The nurse caring for him was suitably qualified to administer IV and epidural drug infusions. When the infusions were complete the nurse changed infusion syringes, reconnecting them to the existing extension tubing, although these should also have been changed and clearly labelled. Half an hour after the infusions were changed, Mr Ward suffered a respiratory arrest, was admitted to ITU but died several days later. On investigation it transpired that a morphine infusion had been connected to the epidural catheter by the staff nurse in error.

- (2) Professional liability means that in the example in Box 1.4 the incident is automatically reported to the NMC and a professional conduct hearing arranged. In this hearing, evidence about the staff nurse's action and any mitigating circumstances, including the nurse's conduct record, is taken into consideration. The committee decides, on the basis of the evidence given, whether the staff nurse should remain on the Register or not. The committee's responsibility is to decide whether or not the public needs to be protected from an incompetent practitioner, not to punish the nurse concerned. They are able to make recommendations about future supervision and education for the nurse concerned if it is decided that he is not to be struck off the Register. Those who are struck off the Register are not able to practise as a professional.
- (3) Accountability to the public is concerned with action that constitutes a criminal and/or civil offence. Clearly, causing the death of a patient is a criminal offence, as in Mr Ward's case. In this event the coroner takes control of the case, orders a post-mortem and calls an inquest into the death. The police charge the staff nurse with an offence committed in connection with Mr Ward's death

(manslaughter, or murder if the staff nurse had the intent to kill) and prosecute the staff nurse in the Crown Court. It is the responsibility of the prosecuting barristers (acting on behalf of the public) to prove to the jury that the staff nurse is guilty of the offence beyond a reasonable doubt. If the jury's verdict is pronounced as guilty the sentence given is at the judge's discretion but follows the guidance laid down by the statute for issues of involuntary manslaughter (recklessness or gross negligence). Such cases are rare but usually attract a high media profile.

- (4) Employers expect their employees to follow their reasonable instructions in the form of policies and procedures, using their professional skills and due care. If an employer (usually in the form of a manager and a personnel or human resources department in a Trust) feels that an employee has breached their contract of employment, then disciplinary action may be taken. The staff nurse caring for Mr Ward is immediately suspended from duty on full pay, pending an inquiry. The Trust could decide to dismiss the staff nurse regardless of the outcome of any other inquiry or court case. If he is struck off the Register by the NMC for the incident, the Trust could not continue to employ him – registration is a condition of employment for a staff nurse. If, however, he is not struck off the Register, the Trust could decide not to dismiss him but to demote him, move him to another department or put in place an expectation of completing a period of supervised practice and training and achieving an agreed set of outcomes or competences.

Vicarious liability

In addition to the staff nurse's accountability to his employer, the Trust has vicarious liability for its employees. This means that if employees practise within the guidelines stated by their employer, the Trust is held responsible for employees' actions. In the example in Box 1.4, the Trust Mr Ward was treated by