ACCCN’S CRITICAL CARE NURSING
ACCCN’S CRITICAL CARE NURSING
SECOND EDITION

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Foreword

As a specialty area of nursing practice, critical care nursing is focused on the care of patients who are experiencing life-threatening illness. Globally, critical care nurses provide care to ensure that critically ill patients and their families receive optimal care. This second edition of the Australian College of Critical Care Nurses (ACCCN’s) Critical Care Nursing is a valuable resource for critical care nursing practice. The editors, who are acknowledged expert practitioners, educators, and researchers in critical care, have organised the book into topics covering the scope of critical care, principles and practice of critical care, and specialty practice in critical care. The content covered in this book, written by established experts in the field of critical care, provide a comprehensive overview of critical care nursing concepts and practices. The book provides up-to-date information on evidence-based practices and the chapters incorporate a variety of educational resources including website links, case studies and practice tips.

ACCCN’s Critical Care Nursing is a beneficial resource for critical care nurses, regardless of practice setting. In seeking to provide complex high intensity care, therapies and interventions, critical care nurses will find that the book reviews essential content related to critical care nursing knowledge and skills to provide care to acutely ill patients and their families.

Internationally, there are more than 500,000 critical care nurses, representing one of the largest specialty areas of nursing practice. The importance of maintaining knowledge of best practices, utilising evidence-based approaches, and applying research to clinical practice for critical care patients remain essential components of critical care nursing. This second edition of ACCCN’s Critical Care Nursing is a comprehensive resource for critical care nurses seeking to further develop their knowledge and enhance their clinical practice expertise.

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Critical care as a clinical specialty is over half a century old. With every successive decade, advances in the education and practices of critical care nurses have been made. Today, critical care nurses are some of the most knowledgeable and highly skilled nurses in the world, and ongoing professional development and education are fundamental elements in ensuring we deliver the highest quality care to our patients and their families.

This book is intended to encourage and challenge nurses to further develop their critical care nursing practice. Our vision for the first edition was for an original text from Australasian authors, not an adaptation of texts produced in other parts of the world. This writing approach more accurately captures the uniquely local elements that form contemporary critical care nursing in Australia and New Zealand and help to answer the myriad of questions posed by critical care nurses as they practise in the local environment, while still allowing the universal core elements that represent critical care practice internationally.

This second edition of ACCCN’s Critical Care Nursing has 27 chapters that reflect the collective talent and expertise of 50 contributors – a strong mix of academics and clinicians with a passion for critical care nursing – in showcasing the practice of critical care nursing in Australia, New Zealand, Asia and the Pacific. We also engaged contributors beyond Australasia to reflect global practices and to extend the applicability of our text to a wider geographic audience. All contributors were carefully chosen for their current knowledge, clinical expertise and strong professional reputations.

The book has been developed primarily for use by practising critical care clinicians, managers, researchers and graduate students undertaking a specialty critical care qualification. In addition, senior undergraduate students studying high acuity nursing subjects will find this book a valuable reference tool, although it goes beyond the learning needs of these students. The aim of the book is to be a comprehensive resource, as well as a portal to an array of other important resources, for critical care nurses. The nature and timeline of book publishing dictates that the information contained in this book reflects a snapshot in time of our knowledge and understanding of the complex world of critical care nursing. We therefore encourage our readers to continue to also search for the most contemporary sources of knowledge to guide their clinical practice. A range of website links have been included in each chapter to facilitate this process.

This second edition is again organised in three broad sections: the scope of critical care nursing, core components of critical care nursing, and specialty aspects of critical care nursing. Inclusion of new chapters and significant revisions to existing chapters were based on our reflections and suggestions from colleagues and reviewers as well as on evolving and emerging practices in critical care.

Section 1 introduces a broad range of professional issues related to practice that are relevant across critical care. Initial chapters provide contemporary information on the scope of practice, systems and resources, quality and safety, recovery and rehabilitation, and ethical issues.

Content presented in the second section is relevant to the majority of critical care nurses, with a focus on concepts that underpin practice such as essential physical, psychological, social and cultural care. Remaining chapters in this section present a systems approach in supporting physiological function for a critically ill individual. This edition now has multiple linked chapters for some of the major physiological systems – 4 chapters for cardiovascular, 3 for respiratory, and 2 for neurological. Chapters on support of renal function, gastrointestinal, liver and nutritional alterations, management of shock, and multi-organ dysfunction complete this section.

The third section presents specific clinical conditions such as emergency presentations, trauma, resuscitation, paediatric considerations, pregnancy and post-partum considerations, and organ donation, by building on the principles outlined in Section 2. This section enables readers to explore some of the more complex or unique aspects of specialty critical care nursing practice.

Chapters have been organised in a consistent format to ease identification of relevant material. Where appropriate, each chapter commences with an overview of relevant anatomy and physiology, and the epidemiology of the clinical states in the Australian and New Zealand setting. Nursing care of the patient, both delivered independently or provided collaboratively with other members of the healthcare team, is then presented. Pedagogical features include a case study that elaborates relevant care issues,
a critique of a research publication that explores a related topic, and learning activities to assist both the reader and those in educational roles to assess knowledge acquisition. Extensive use of tables, figures and practice tips are located throughout each chapter to identify areas of care that are particularly pertinent for readers. It is not our intention that readers progress sequentially through the book, but rather explore chapters or sections that are relevant for different episodes of learning or practice.

The delivery of effective, high-quality critical care nursing practice is a challenge in contemporary health care. We trust that this book will be a valuable resource in supporting your care of critically ill patients and their loved ones.

Doug Elliott
Leanne Aitken
Wendy Chaboyer
About the Australian College of Critical Care Nurses (ACCCN)

The Australian College of Critical Care Nurses, with over 2400 members, is the peak professional organisation representing critical care nurses in Australia. Membership types include standard membership, international members, life members, honorary members and corporate members. All individual members are eligible and are encouraged to participate in the activities of the College; to receive the College journal and *Critical Times* publication, in addition to discounts for ACCCN conference registration and for ACCCN publications. Life and honorary memberships are awarded to individuals in recognition of their outstanding contribution to ACCCN and/or to critical care nursing excellence in Australia.

ACCCN is a company limited by guarantee and has branches in each state of Australia, with two members from each state branch management committee forming the ACCCN National Board of Directors. Each committee facilitates the activities of the college at a local/state level and provides local and at times national representation. The ACCCN Editorial Committee and Editorial Board, under the leadership of the editor of the *Australian Critical Care* (ACC) journal, are responsible for the College publications including the journal *Australian Critical Care* and newspaper *Critical Times*.

There are a number of national advisory panels and special interest groups dedicated to providing the organisation with expert opinion on issues relating to critical care nursing. These include:

- **Resuscitation Advisory Panel**: consists of eight members representing each branch of ACCCN, plus a paediatric nurse representative. It has developed a complete suite of contemporary advanced life support and resuscitation educational material and offers its ACCCN National ALS Courses throughout Australia;
- **Research Advisory Panel**: in addition to providing expert advice to ACCCN, the panel is responsible for evaluating and making recommendations on research strategy and grant submissions to ACCCN, and for evaluating abstracts submitted to the ANZICS/ACCCN Annual Scientific Meeting on Intensive Care;
- **Education Advisory Panel**: advises ACCCN on all matters relating to education specific to critical care nursing. This panel has developed a position paper on critical care nursing education and written submissions on behalf of ACCCN to national reviews of nursing education;
- **Workforce Advisory Panel**: has represented ACCCN on a number of national health workforce and nursing committees. The panel has also developed position statements on nurse staffing for intensive care and high-dependency units in Australia, and annually reviews the dataset design for national workforce data collection in conjunction with ANZICS;
- **Organ & Tissue Donation & Transplantation Advisory Panel**: advises the board and developed a position statement on organ donation and transplantation as it relates to intensive care. It disseminates related information to critical care nurses regarding the promotion and national reform objectives of organ and tissue donation in Australia;
- **Quality Advisory Panel**: provides expert knowledge, advice and information to ACCCN on matters relevant to critical care nursing practice relating specifically to patient management;
- **Paediatric Advisory Panel**: provides expert knowledge, advice and information to ACCCN on matters relevant to paediatric critical care nursing in addition to recommending content and speakers for the annual ACCCN conferences;
- **The ICU Liaison Special Interest Group**: is a collective group of ACCCN members who have an interest in ICU liaison/outreach and work together to discuss matters relevant to this increasing area of critical care nursing focus.

In addition to branch educational events and symposiums, ACCCN conducts three national conferences each year: ACCCN Institute of Continuing Education (ICE); and, in conjunction with our medical colleagues from The Australian and New Zealand Intensive Care Society (ANZICS), the ANZICS/ACCCN Annual Scientific Meeting on Intensive Care and the Australian and New Zealand Paediatric & Neonatal Intensive Care Conference.

ACCCN has a representative on the Australian Resuscitation Council (ARC), and has representation at a federal government advisory level through the Nursing and Midwifery Stakeholder Reference Group (NMSRG) chaired by the Chief Nurse of Australia, and is also a member of the Coalition of National Nursing Organisations (CoNNO). The founding Chairperson of the World Federation of Critical Care Nurses (WFCCN) continues to represent ACCCN on the WFCCN Council, and the College also has representatives on the World Federation of Paediatric Intensive and Critical Care Societies, and is a member of the Intensive Care Foundation.

More information can be found on the ACCCN website: www.acccn.com.au
About the Editors

Doug Elliott
Doug Elliott is Professor of Nursing in the Faculty of Nursing, Midwifery and Health at the University of Technology, Sydney. During his 25 years as a nurse academic, Doug has been a faculty Director of Research, Clinical Professor, Head of Department and a conjoint hospital appointment as Assistant Director of Nursing – Research. Prior to this, he worked as a clinician in acute and critical care areas in tertiary hospitals in Sydney and Perth.

Doug’s clinical and health services research focuses on the health-related quality of life (HRQOL) and illness experiences of individuals with critical and acute illnesses, and the use of technologies to improve patient outcomes. Doug has received research funding from the NHMRC and the Australian Commission on Safety and Quality in Health Care, as well as competitive funding from other national organisations, health service and university funding sources. He has published over 80 peer-reviewed articles and book chapters, and is co-editor for two additional books, on nursing and midwifery research, and pathophysiology and nursing practice.

Doug became a Life Member of the Australian College of Critical Care Nurses in 2006 in recognition of over 20 years of service to critical care. He has previously been an Associate Editor and on the Editorial Board for Australian Critical Care, was the inaugural Chair of the Research Advisory Panel, a member of the Education Advisory Panel, and also served on the NSW committee. He is currently on the Editorial Board for the American Journal of Critical Care, and peer-reviews for several critical care medicine and nursing journals, and a range of competitive funding bodies. Doug has been an invited speaker to international and national multi-disciplinary critical care meetings on numerous occasions.

Leanne Aitken
Leanne Aitken is Professor of Critical Care Nursing at Griffith University and Princess Alexandra Hospital, Queensland. She has a long career in critical care nursing, including practice, education and research roles. In all her roles in nursing, Leanne has been inspired by a sense of enquiry, pride in the value of expert nursing and a belief that improvement in practice and resultant patient outcomes is always possible. Research interests include developing and refining interventions to improve long term recovery of critically ill and injured patients, decision-making practices of critical care nurses and a range of clinical practice issues within critical care and trauma.

Leanne has been active in ACCCN for more than 20 years and was made a Life Member of the College in 2006 after having held positions on state and national boards, coordinated the Advanced Life Support course in Western Australia in its early years, chaired the Education Advisory Panel and been an Associate Editor with Australian Critical Care. In addition, she is a peer reviewer for a number of national and international journals and reviews grant applications for a range of organisations including the National Health and Medical Research Council (NHMRC) and Intensive Care Foundation. She is the World Federation of Critical Care Nurses’ representative on a number of sepsis related working groups including an international group who authored a companion paper to the Surviving Sepsis Campaign guidelines to summarise the evidence underpinning nursing care of the septic patient, the revision of the Surviving Sepsis Campaign Guidelines and the Global Sepsis Alliance.

Wendy Chaboyer
Wendy Chaboyer is a Professor of Nursing at Griffith University and the Director of the Centre of Research Excellence in Nursing Interventions for Hospitalised Patients, funded by the National Health and Medical Research Council (NHMRC) (2010–2015). Wendy has 30 years experience in the critical care area, as a clinician, educator and researcher and she is passionate about the contribution nurses can make to a patient’s, and their family’s, hospital experience. Her research has focused on ICU patients’ transitions and on continuity of care for ICU patients. More recently, she has focused on patient safety, undertaking research into adverse events after ICU, clinical handover and ‘transforming care at the bedside’.

Wendy has been active in ACCCN since her arrival in Australia in the early 1990s. She has been a National Board member and member of the Queensland Branch Management Committee. Wendy is a past Chair of the Research Advisory Panel and past Chair of the Quality Advisory Panel of the ACCCN. Wendy played a role in the formation of the World Federation of Critical Care Nurses and continues to support their activities. Wendy reviews for a number of journals and funding bodies such as the NHMRC and the Australian Research Council.
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Finally, and most importantly, to our respective loved ones – Maureen, Kate, Nick and Josh; Steve; and Michael – thanks for your belief in us, and your understanding and commitment in supporting our careers.

Doug Elliott
Leanne Aitken
Wendy Chaboyer
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<td>A/C MV</td>
<td>assist-controlled mechanical ventilation</td>
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<td>AACN</td>
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<td>AATT</td>
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<td>Australian College of Critical Care Nurses</td>
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<td>ACD</td>
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<td>ACE</td>
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<td>ACEM</td>
<td>Australasian College of Emergency Medicine</td>
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<td>ACh</td>
<td>acetylcholine</td>
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<td>AChE</td>
<td>acetylcholinesterase</td>
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<td>ACN</td>
<td>advanced clinical nurse</td>
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<td>ACNP</td>
<td>acute care nurse practitioner</td>
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<td>ACS</td>
<td>acute coronary syndrome</td>
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<td>ACS</td>
<td>abdominal compartment syndrome</td>
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<td>ACT</td>
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<td>ACTH</td>
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<td>ADAPT</td>
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<td>ADH</td>
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<td>ADL</td>
<td>activities of daily living</td>
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<td>ADP</td>
<td>adenosine diphosphate</td>
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<td>AE</td>
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<td>AED</td>
<td>automatic external defibrillator</td>
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<td>AHA</td>
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<td>AHEC</td>
<td>Australian Health Ethics Committee</td>
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<td>AIS</td>
<td>abbreviated injury score</td>
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<td>AKI</td>
<td>acute kidney infection</td>
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<td>ALF</td>
<td>acute liver failure</td>
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<tr>
<td>ALI</td>
<td>acute lung injury</td>
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<td>ALP</td>
<td>alkaline phosphatase</td>
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<td>ALS</td>
<td>advanced life support</td>
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<td>ALT</td>
<td>alanine aminotransferase</td>
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<td>AMI</td>
<td>acute myocardial infarction</td>
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<td>AND</td>
<td>autonomic nerve dysfunction</td>
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<td>ANP</td>
<td>atrial natriuretic peptide</td>
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<td>ANZBA</td>
<td>Australian and New Zealand Burn Association</td>
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<td>ANZICS</td>
<td>Australian and New Zealand Intensive Care Society</td>
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<td>ANZOD</td>
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<td>AoCLF</td>
<td>acute-on-chronic liver failure</td>
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<td>AODR</td>
<td>Australian Organ Donor Register</td>
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<td>AORTIC</td>
<td>Australasian Outcomes Research Tool for Intensive Care</td>
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<td>APACHE</td>
<td>acute physiology and chronic health evaluation</td>
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<td>APC</td>
<td>activated protein C</td>
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<td>APRV</td>
<td>airway pressure release ventilation</td>
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<td>aPTT</td>
<td>activated partial thromboplastin time</td>
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<td>ARAS</td>
<td>ascending reticular activating system</td>
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<td>ARC</td>
<td>Australian Resuscitation Council</td>
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<td>ARDS</td>
<td>acute respiratory distress syndrome</td>
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<td>ARF</td>
<td>acute renal failure</td>
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<td>ASL</td>
<td>arterial spin labelling</td>
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<td>AST</td>
<td>aspartate aminotransfer</td>
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<td>ATC</td>
<td>automatic tube compensation</td>
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<td>ATCA</td>
<td>Australasian Transplant Coordinators Association</td>
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<td>ATN</td>
<td>acute tubular necrosis</td>
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<td>ATP</td>
<td>adenosine triphosphate</td>
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<td>ATS</td>
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<td>AV</td>
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<td>AVDO2</td>
<td>arteriovenous difference in oxygen</td>
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<td>AVM</td>
<td>arteriovenous malformation</td>
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<td>AVPU</td>
<td>Alert/response to Voice/only responds to Pain/Unconscious</td>
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<td>BBB</td>
<td>blood–brain barrier</td>
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<td>BDI</td>
<td>Beck Depression Inventory</td>
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<td>BiPAP</td>
<td>bilevel positive airway pressure</td>
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<td>BIVAD</td>
<td>biventricular assist device</td>
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<td>BIS</td>
<td>bispectral index</td>
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<td>BLS</td>
<td>basic life support</td>
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<td>Bag/mask ventilation</td>
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<td>BP</td>
<td>blood pressure</td>
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<td>BPS</td>
<td>Behavioural Pain Scale</td>
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<td>BSA</td>
<td>body surface area</td>
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<td>BSLTx</td>
<td>bilateral sequential lung transplantation</td>
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<td>BTF</td>
<td>Brain Trauma Foundation</td>
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<td>BURP</td>
<td>Backwards, upwards, rightward pressure</td>
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<td>BVM</td>
<td>bag–valve–mask</td>
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<td>CaO2</td>
<td>content of arterial oxygen in the blood</td>
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<td>CABG</td>
<td>coronary artery bypass graft</td>
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<td>CAM-ICU</td>
<td>Confusion Assessment Method – Intensive Care Unit</td>
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<td>CAP</td>
<td>community-acquired pneumonia</td>
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<td>CAUTI</td>
<td>Catheter-associated urinary tract infection</td>
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<td>CAV</td>
<td>cardiac allograft vasculopathy</td>
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<td>CAVH</td>
<td>continuous arteriovenous haemofiltration</td>
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CBF  cerebral blood flow
CBG  corticosteroid-binding globulin
CCF  chronic cardiac failure
CCU  critical care unit—may be intensive care, coronary care, high dependency or a combination of these
CCU  coronary care unit
CDSS  clinical decision support system
CEO2  cerebral oxygen extraction
CES–D  Center for Epidemiologic Studies–Depression
CFI  cardiac function index
CFM  cerebral function monitoring
CHD  coronary heart disease
CHF  chronic heart failure
Cl  cardiac index
Cl  critical illness
CIM  critical illness myopathy
CINM  critical illness neuromyopathy
CIP  critical illness polyneuropathy
CIPNP  critical illness polyneuropathy
CIS  clinical information system
CK  creatine kinase
CLAB  Central line associated bacteremia
CLD  chronic liver disease
CLF  chronic liver failure
cLMA  classic laryngeal mask airway
CLRT  continuous lateral rotation therapy
CMV  controlled mechanical ventilation
CMV  cytomegalovirus
CNE  clinical nurse educator
CNPI  checklist of nonverbal pain Indicators
CNS  central nervous system
CO  carbon monoxide
CO  cardiac output
CO2  carbon dioxide
COAD  chronic obstructive airways disease
COPD  Chronic Obstructive pulmonary disease
CPAP  continuous positive airway pressure
CPB  cardiopulmonary bypass
CPDU  clinical practice development unit
CPG  clinical practice guideline
CPM  cuff pressure monitoring
CPOE  computerised physician (provider) order entry
CPOT  Critical Care Pain Observation Tool
CPP  cerebral perfusion pressure
CPP  coronary perfusion pressure
CPR  cardiopulmonary resuscitation
CRASH  corticosteroid randomisation after significant head injury
CRF  chronic renal failure
CRH  corticotrophin-releasing hormone
CRP  c-reactive protein
CRRT  continuous renal replacement therapy
CSF  cerebrospinal fluid
CSSU  central sterile supply unit
CSWS  central salt-wasting syndrome
CT  computerised tomography
CTG  clinical trials group (of ANZICS)
CVC  central venous catheter
CVD  cardiovascular disease
CVo2  central venous oxygenation
CVP  central venous pressure
CVVH  continuous veno-venous haemofiltration
CVVHDf  continuous veno-venous haemodiafiltration
CXR  chest X-ray
DAI  diffuse axonal injury
DASS  Depression Anxiety and Stress Scale
DAT  decision analysis theory
DCD  donor after cardiac death
DCM  dilated cardiomyopathy
DDAVP  1-deamino-8-D-arginine vasopressin (Vasopressin)
DKA  diabetic ketoacidosis
DO2  oxygen delivery
DPL  diagnostic peritoneal lavage
DRG  diagnosis-related group
DSC  (MRI) dynamic susceptibility contrast
DVT  deep venous thrombosis
EBI  electrical burn injury
EBN  evidence based nursing
EBP  evidence based practice
EC  ethics committee
EC  extracorporeal circuit
ECC  external cardiac compression
ECG  electrocardiograph/y
ECMO  extracorporeal membrane oxygenation
ED  emergency department
EDD  extended daily dialfiltration
EDD-f  extended daily dialysis filtration
EDIS  Emergency Department Information System
EEG  electroencephalogram
EGDT  early goal-directed therapy
EMD  electromechanical dissociation
EMS  emergency medical system
EN  enteral nutrition
ENID  emerging novel infectious disease
EPAP  expiratory positive airway pressure
ePD  emancipatory practice development
EQ-5D  Euroquol 5D
ERC  European Resuscitation Council
ESBL-E  extended-spectrum beta-lactamase-producing Enterobacteriaceae
ESLD  end stage liver disease
ESLF  end-stage liver failure
ETC  (o)esophageal–tracheal Combitube
ETCO2  end-tidal carbon dioxide
ETIC-7  experience after treatment in intensive care
ETT  endotracheal tube
eVLW  extravascular lung water
FAED  fully automatic external defibrillator
FAST  focused assessment with sonography for trauma
FBC  full blood count
FDA  (US) Food and Drug Administration
FES  fat embolism syndrome
FEV1  forced expiratory volume in 1 second
FFA  free fatty acid
ABBREVIATIONS

FFP  fresh frozen plasma
FI  fear index
FIO2  fraction of inspired oxygen
fMRI functional magnetic resonance imaging
FRC functional residual capacity
FTE full-time equivalent (equivalent to 76-hour fortnight)
FVC forced vital capacity
FWR family witness resuscitation
GABA gamma-aminobutyric acid
GAS general adaptation syndrome
GCS Glasgow Coma Scale
GEDV global end-diastolic volume
GGT gamma-glutamyl transpeptidase
GI gastrointestinal
GIT gastrointestinal tract
GM1 monosialoganglioside
GTN glyceryl trinitrate
HCO3− sodium bicarbonate
H2CO3 carbonic acid
H+ hydrogen
HADS hospital anxiety and depression scale
HAI Healthcare acquired infection
Hb haemoglobin
HbF fetal haemoglobin
HCM hypertrophic cardiomyopathy
HDU high-dependency unit
HE hepatic encephalopathy
HFA Heart Foundation Australia
HFC high flow nasal cannula
HFOV high-frequency oscillatory ventilation
HH heated humidification
HHNS hyperglycaemic hyperosmolar non-ketotic state
Hib Haemophilus influenzae type b
HIT Heparin-induced thrombocytopenia
HME heat–moisture exchanger
HPA hypothalamic–pituitary–adrenal
HRC Health Research Council (New Zealand)
HRQOL health-related quality of life
HRS hepatorenal syndrome
HSV herpes simplex virus
HTLV human T-lymphotropic virus
I:E inspiratory:expiratory (ratio)
IABP intra-aortic balloon pump
IAC interposed abdominal compression
IAP intra-abdominal pressure
ICC intercostal catheter
ICD implantable cardioverter defibrillator
ICDSC Intensive Care Delirium Screening Checklist
ICG indocyanine green
ICH intracranial haemorrhage
ICP intracranial pressure
ICT information and communications technologies
ICU intensive care unit
ICU-AW intensive care unit acquired weakness
ICU LN intensive care unit liaison nurse
IDC indwelling catheter
I:E inspiratory:expiratory (ratio)
IES impact of events scale
IgE immunoglobulin E
IHD intermittent haemodialysis
IL interleukin
ILCOR International Liaison Committee on Resuscitation
IMA internal mammary artery
INR International Normalized Ratio
IO intraosseous
IPP information privacy principles
IPPV intermittent positive pressure ventilation
IPT information-processing theory
ISS injury severity score
ITBV intrathoracic total blood volume
IVC inferior vena cava
IVig intravenous immunoglobulin
JE Japanese B encephalitis
ICH intracranial haemorrhage
ICP intracranial pressure
LVAD left ventricular assist device
LVEDV left ventricular end-diastolic volume
LVEF left ventricular ejection fraction
LVF left ventricular failure
LVP left ventricular pressure
LVSWI left ventricular stroke work index
MAP mean arterial pressure
MARS molecular adsorbent(s) recirculating system
MASS Motor Activity Assessment Scale
MCA middle cerebral artery
MED manual external defibrillator
MET medical emergency team
MET(s) metabolic equivalent(s)
MEWS medical early-warning system
MIDCAB minimally invasive direct coronary artery bypass
MIDCM minimally invasive direct cardiac massage
mmHg millimetres of mercury
MODS multiple organ dysfunction syndrome
MRI magnetic resonance imaging
MRO Multi-resistant organisms
MRS magnetic resonance spectroscopy
MRSA methicillin-resistant Staphylococcus aureus
MVC motor vehicle collision
MVE Murray Valley encephalitis
NAC N-acetylcyesteine
NAS nursing activities scale
NASCIS National Acute Spinal Cord Injury Study
NAT nucleic acid testing
NDE near-death experience
NDU nursing development unit
NE norepinephrine
NFkB nuclear factor kappa B
NGT nasogastric tube
NHBD non-heart-beating donation
NHMRC National Health and Medical Research Council
NHP Nottingham Health Profile
NIBP non-invasive blood pressure
NIRS near-infrared spectroscopy
NIV non-invasive ventilation
NMB neuromuscular blocking
NMDA N-methyl-d-aspartate
NMJ neuromuscular junction
NO nitrous oxide
NO2 nitric oxide
NOC Nurse observation checklist
NOK next of kin
NP nurse practitioner
NPA nasopharyngeal aspirate
NPP national privacy principles
NPY neuropeptide Y
NSAIDS Non-steroidal anti-inflammatory drugs
NTS national triage scale
NTT nasotracheal tube
NYHA New York Heart Association
O2 oxygen
ODIN organ dysfunction and/or infection
OEF oxygen extraction fraction
OHCA out-of-hospital cardiac arrest
OLTx orthotopic liver transplantation
OSA Obstructive sleep apnoea
OTDA Organ and Tissue Donation Agency
Pa arterial pressure
Paw peak airway pressure
PaCO2 partial pressure of carbon dioxide in arterial blood
PaO2 partial pressure of oxygen in arterial blood
PaO2 partial pressure of arterial oxygen
PaO2 partial pressure of oxygen in arterial blood
PaO2 peak airway pressure
P arterial pressure
Paco2 partial pressure of carbon dioxide in arterial blood
PaO2 partial pressure of oxygen in arterial blood
Pac pulmonary artery catheter
PAO2 arterial oxygen pressure
PAO2 pulmonary artery occlusion pressure
PAP pulmonary artery pressure
PART patient-at-risk team
PAWP pulmonary artery wedge pressure
PbtO2 brain tissue oxygen
PCI percutaneous coronary intervention
PCT dynamic perfusion computed tomography
PCV pressure-controlled ventilation
PCWP pulmonary capillary wedge pressure
PD peritoneal dialysis
PDH pulmonary dynamic hyperinflation
PDR plasma disappearance rate
PDSA plan, do, study, act
PDU practice development unit
PE pulmonary embolism
PEA pulseless electrical activity
PEEP positive end-expiratory pressure
PEFR peak expired flow rate
PET positron emission tomography
PETCO2 positive end-tidal carbon dioxide
pH acid–alkaline logarithmic scale
Pl pulsatility index
PICC peripherally inserted central catheter
PICCO pulse-induced contour cardiac output
PICU paediatric intensive care unit
PN parenteral nutrition
PND paroxysmal nocturnal dyspnoea
PNS peripheral nervous system
Pplat plateau pressure
PPE personal protective equipment
PROWESS (recombinant human-activated) protein C worldwide evaluation in severe sepsis
PRVC pressure-regulated volume control
PSG Polysomnography
PT prothrombin time
PTA posttraumatic amnesia
PTCA percutaneous transluminal coronary angioplasty
PTSD posttraumatic stress disorder
PTSS posttraumatic stress symptoms
PTT partial thromboplastin time
Pv venous pressure
PvO2 mixed venous oxygen pressure
PVR peripheral vascular resistance
QI quality improvement
QOL quality of life
QOIL–IT quality of life–Italian version
QOL–SP quality of life–Spanish version
QUM quality use of medicines
QWB quality of wellbeing
RAAS renin–angiotensin–aldosterone system
RASS Richmond Agitation–Sedation Scale
RAS reticular activating system
RBC red blood cell
RCQA root cause analysis
RCRA right coronary artery
RCSQ Richards-Campbell Sleep Questionnaire
REM Rapid eye movement
RICA Right Internal Carotid Artery
ROSC return of spontaneous circulation
RRS rapid response system
RR respiratory rate
RRT rapid response teams
RRT renal replacement therapy
RTS revised trauma score
RVF right ventricular failure
RVP right ventricular pressure
RVSFI right ventricular stroke work index
SaO2 saturation of oxygen in arterial blood
SpO2 saturation of oxygen in peripheral tissues
Svo2 venous oxygen saturation
SA sinoatrial
SAC safety assessment coding
SAED semiautomatic external defibrillator
SAFE Saline versus Albumin Fluid Evaluation (trial)
ABBREVIATIONS

SAH  subarachnoid haemorrhage
SAI  State Anxiety Inventory
SAPS  simplified acute physiology score
SARS  severe acute respiratory syndrome
SARS-CoV  severe acute respiratory syndrome coronavirus
SAS  Sedation Agitation Scale
SBE  serum base excess
SBP  systolic blood pressure
SCA  sudden cardiac arrest
SCI  spinal cord injury
SCUF  slow continuous ultrafiltration
SE  status epilepticus
SEI  sleep efficiency index
SF-36  Short Form 36
SGRQ  St George's Respiratory Questionnaire
SIADH  syndrome of inappropriate antidiuretic hormone secretion
SICQ  Sleep in Intensive Care Questionnaire
SIG  strong ion gap
SIMV  synchronised intermittent mandatory ventilation
SIP  sickness impact profile
SIRS  systemic inflammatory response syndrome
SjvO2  jugular venous oxygen saturation
SLTx  single lung transplantation
SOFa  sepsis-related/segmental organ failure assessment
SPECT  single photon emission computed tomography
SR  systematic review
SSG  surviving sepsis guidelines
STAI  State Trait Anxiety Inventory
STEMI  ST-elevation myocardial infarction
SVDK  snake venom detection kit
SVG  saphenous vein graft
SVR  systemic vascular resistance
SVT  supraventricular tachycardia
SVV  stroke volume variation
SWS  Slow wave sleep
TAI  thrombin-activatable fibrinolysis inhibitor
TB  tuberculosis
TBI  traumatic brain injury
TCD  transcranial Doppler
TEG  thromboelastograph
TIPS  transjugular intrahepatic portosystemic shunt/stent
TISS  therapeutic intervention scoring system
TLC  total lung capacity
TNF[alpha]  tumour necrosis factor alpha
TNS  Tumour Necrosis Factor
TOE  transoesophageal echocardiogram/y
tPA  tissue plasminogen activator
tPD  technical practice development
TPN  total parenteral nutrition
TPR  temperature, pulse, respirations
TSANZ  Transplant Society of Australia and New Zealand
TSC  trauma symptom checklist
TSH  thyroid-stimulating hormone
TST  Total sleep time
TT  thrombin time
TV  tidal volume
TVI  time velocity interval
UET  urea, electrolytes, creatinine
UO  urine output
UROI  upper respiratory tract infection
V  ventilation
V/Q  ventilation/perfusion
Vt  tidal volume
VALI  ventilator-associated lung injury
VAP  ventilator-acquired pneumonia
VAS  Visual analogue scale
VAS-A  Visual analogue scale – Anxiety
VC  Vital capacity
VCV  volume-controlled ventilation
VE  minute ventilation
VF  ventricular fibrillation
VICS  Vancouver Interaction and Calmness Scale
VO2  oxygen consumption
VRE  vancomycin-resistant Enterococcus
VT  ventricular tachycardia
VTE  venous thromboembolism
VV  veno-venous
WBC  white blood cell
WCC  white cell count
WFCCN  World Federation of Critical Care Nurses
WHO  World Health Organization
WOB  work of breathing
XeCT  xenon-enhanced computed tomography
Scope of Critical Care
After reading this chapter, you should be able to:

- describe the history and development of critical care nursing practice, education and professional activities
- discuss the influences on the development of critical care nursing as a discipline and the professional development of individual nurses
- outline the various roles available to nurses within critical care areas or in outreach services
- discuss the potential impact of clinical decision-making processes on patient outcomes
- consider processes in the work and professional environment that are influenced by local leadership styles.

Learning objectives

Critical care as a specialty in nursing has developed over the last 30 years. Importantly, development of our specialty in Australia and New Zealand has been in concert with development of intensive care medicine as a defined clinical specialty. Critical care nursing is defined by the World Federation of Critical Care Nurses as:

Specialised nursing care of critically ill patients who have manifest or potential disturbances of vital organ functions. Critical care nursing means assisting, supporting and restoring the patient towards health, or to ease the patient’s pain and to prepare them for a dignified death. The aim of critical care nursing is to establish a therapeutic relationship with patients and their relatives and to empower the individuals’ physical, psychological, sociological, cultural and spiritual capabilities by preventive, curative and rehabilitative interventions.

Critically ill patients are those at high risk of actual or potential life-threatening health problems. Care of the critically ill can occur in a number of different locations in hospitals. In Australia and New Zealand, critical care is generally considered a broad term, incorporating subspecialty areas of emergency, coronary care, high-dependency, cardiothoracic, paediatric and general intensive care units.

This chapter provides a context for subsequent chapters, outlining some key principles and concepts for studying and practising nursing in a range of critical care areas. The scope of critical care nursing is described in the Australian and New Zealand contexts, which in turn have some influence on clinical practice in Southeast Asia and the Pacific. Development of the specialty is discussed, along with the professional development and evolving roles of critical care nurses in contemporary health care, including clinical decision making and leadership.

DEVELOPMENT OF CRITICAL CARE NURSING

Critical care as a specialty emerged in the 1950s and 1960s in Australasia, North America, Europe and South Africa. During these early stages, critical care consisted...
primarily of coronary care units for the care of cardiology patients, cardiothoracic units for the care of postoperative patients, and general intensive care units for the care of patients with respiratory compromise. Later developments in renal, metabolic and neurological management led to the principles and context of critical care that exist today.

Development of critical care nursing was characterised by a number of features, including:
- the development of a new, comprehensive partnership between nursing and medical clinicians
- the collective experience of a steep learning curve for nursing and medical staff
- the courage to work in an unfamiliar setting, caring for patients who were extremely sick – a role that required development of higher levels of competence and practice
- a high demand for education specific to critical care practice, which was initially difficult to meet owing to the absence of experienced nurses in the specialty
- the development of technology such as mechanical ventilators, cardiac monitors, pacemakers defibrillators, dialysers, intra-aortic balloon pumps and cardiac assist devices, which prompted development of additional knowledge and skills.

There was also recognition that improving patient outcomes through optimal use of this technology was linked to nurses’ skills and staffing levels. The role of adequately educated and experienced nurses in these units was recognised as essential from an early stage, and led to the development of the nursing specialty of critical care. Although not initially accepted, nursing expertise, ability to observe patients and appropriate nursing intensity are now considered essential elements of critical care.

As the practice of critical care nursing evolved, so did the associated areas of critical care nursing education and specialty professional organisations such as the Australian College of Critical Care Nurses (ACCCN). The combination of adequate nurse staffing, observation of the patient and the expertise of nurses to consider the complete needs of patients and their families is essential to optimise the outcomes of critical care. As critical care continues to evolve, the challenge remains to combine excellence in nursing care with judicious use of technology to optimise patient and family outcomes.

CRITICAL CARE NURSING EDUCATION

Appropriate preparation of specialist critical care nurses is a vital component in providing quality care to patients and their families. A central tenet within this framework of preparation is the formalised education of nurses to practise in critical care areas. Formal education – in conjunction with experiential learning, continuing professional development and training, and reflective clinical practice – is required to develop competence in critical care nursing. The knowledge, skills and attitude necessary for quality critical care nursing practice have been articulated in competency statements in many countries.

Critical care nursing education developed in unison with the advent of specialist critical care units. Initially, this consisted of ad-hoc training developed and delivered in the work setting, with nurses and medical officers learning together. For example, medical staff brought expertise in physiology, pathophysiology and interpretation of electrocardiographic rhythm strips, while nurses brought expertise in patient care and how patients behaved and responded to treatment. Training was, however, fragmented and ‘fitted in’ around ward staffing needs. Post-registration critical care nursing courses were subsequently developed from the early 1960s in both Australasia and the UK. Courses ranged in length from 6 to 12 months and generally incorporated employment as well as specific days for lectures and class work. Given the local nature of these courses developed for the local needs of individual hospitals and regions, differences in content and practice therefore developed between hospitals, regions and countries.

During the 1990s the majority of these hospital-based courses in Australasia were discontinued as universities developed postgraduate curricula to extend the knowledge and skills gained in pre-registration undergraduate courses. A significant proportion of critical care nurses now undertake specialty education in the tertiary sector, often in a collaborative relationship with one or more hospitals. One early study of students enrolled in university-based critical care courses in Australia identified a number of burdens (workload, financial, study–work conflicts), but also a number of benefits (e.g. better job prospects, job security).

Within Australia and New Zealand, most tertiary institutions currently offer postgraduate critical care nursing education at a Graduate Certificate or Graduate Diploma level as preparation for specialty practice, although this is often provided as a Master’s degree. In the UK, similar provisions for postgraduate critical care nursing education at multiple levels are available, although some universities also offer critical care specialisation at the undergraduate level (for example, King’s College, London). Education throughout Europe has undergone significant change in the past 10 years as the framework articulated under the Bologna Process has been implemented. In relation to critical care nursing, this has led to the expansion of programs, primarily at the postgraduate level, for specialist nursing education. Critical care nursing education in the USA maintains a slightly different focus, with most postgraduate studies being generic in nature, including a focus on advanced practice roles such as clinical nurse specialists and nurse practitioners, while specialty education for critical care nurses is undertaken as continuing education. Employment in critical care, with associated assessment of clinical competence, remains an essential component of many university-based critical care nursing courses.

Both the impact of post-registration education on practice and the most appropriate level of education that is required to underpin specialty practice remain controversial, with no universal acceptance internationally. Globally, the Declaration of Madrid, which was endorsed...
Critical care nursing involves a range of skills, classified as psychomotor (or technical), cognitive or interpersonal. Performance of specific skills requires special training and practice to enable proficiency. Clinical competence is a combination of skills, behaviours and knowledge, demonstrated by performance within a practice situation and specific to the context in which it is demonstrated. A nurse who learns a skill and is assessed as performing that skill within the clinical environment is deemed competent. As noted above, a set of competency statements for specialist critical care practice comprises 20 competency standards grouped into six domains: professional practice, reflective practice, enabling, clinical problem solving, teamwork and leadership (see Appendix B). The validity of this structure of six domains has been questioned, however, as a number of competency statements are linked to several domains. Further research is therefore required to refine the structure of a competency model with improved construct validity. Other competency domains and assessment tools have also been developed. Although articulated slightly differently, the American Association of Critical-Care Nurses (AACN) provides ‘Standards of Practice and Performance for the Acute and Critical Care Clinical Nurse Specialist’, which outlines six standards of practice (assessment, diagnosis, outcome identification, planning, implementation and evaluation) and eight standards of professional performance (quality of care, individual practice evaluation, education, collegiality, ethics, collaboration, research and resource utilisation) (see Online resources).

CRITICAL CARE NURSING PROFESSIONAL ORGANISATIONS

Professional leadership of critical care nursing has undergone considerable development in the past three decades. Within Australia, the ACCCN (formerly the Confederation of Australian Critical Care Nurses) was formed from a number of preceding state-based specialty nursing bodies (e.g. Australian Society of Critical Care Nurses, Clinical Nurse Specialists Association) that provided professional leadership for critical care nurses since the early 1970s. In New Zealand, the professional interests of critical care nurses are represented by the New Zealand Nurses Organisation, Critical Care Nurses Section, as well as affiliation with the ACCCN. The ACCCN has strong professional relationships with other national peak nursing bodies, the Australian and New Zealand Intensive Care Society (ANZICS), government agencies and individuals, and healthcare companies. Professional organisations representing critical care nurses were formed as early as the 1960s in the USA with the formation of the American Association of Critical Care Nurses (AACN). Other organisations have developed around the world, with critical care nursing bodies now operating in countries from Australasia, Asia, North America, South America, Africa and Europe. In 2001 the inaugural meeting of the World Federation of Critical Care Nurses (WFCCN) was formed to provide professional leadership at an international level. The ACCCN
was a foundation member of the WFCCN and a member associate of the World Federation of Societies of Intensive Care and Critical Care Medicine, and maintains a representative on the councils of both these international bodies. (See the ACCCN website, listed in Online resources, for further details about professional activities.)

ROLES OF CRITICAL CARE NURSES

As the discipline of critical care has developed, so too has the range of roles performed by specialty critical care nurses. The continuum of critical illness (see Chapter 4) includes pre-crisis/proactive care, management of the critical illness, and follow-up care in hospital, clinic and home settings. This continuum also includes the practice of palliative care in the ICU environment. Clinical (bedside) roles and nurse-to-patient ratios for various levels of critical care unit, as well as the roles of unit manager and clinical nurse educator, are discussed in Chapter 2. Practice issues for critical care clinicians are detailed in the remaining chapters of this book. Roles that apply to all nursing professionals are specifically highlighted; for example:

- carer, in Chapters 6, 7 and 8, all practice-related chapters in Section 2, and the specialty chapters in Section 3
- patient and family advocate, in Chapters 5 and 8
- educator, in Chapter 3.

This section focuses on the scope of critical care nurses’ roles inside and external to the critical care area, and provides links to other specific chapters. These roles include:

- consultant
- advanced practice nurse practitioner roles in ICU
- trauma
- emergency (Chapter 22), critical care outreach
- ICU liaison
- research/quality coordinator (Chapter 3).

Developing a body of knowledge and the integral role of research and nurse researchers in that process is described in a later section of this chapter.

CONSULTANT

Expert clinicians in one of the subspecialties of critical care – emergency, general ICU, cardiology, cardiothoracic, neurosciences – play important roles in facilitating improvements in clinical practice for both critical care and non-critical care patients. The consultant’s role involves clinical practice, education, quality improvement and research activities. Within these work portfolios, leadership and the development and dissemination of knowledge within a multidisciplinary team are integral to effective practice. Practice includes role-modelling of expected behaviours, policy and clinical guideline development to support clinical care, and facilitating professional development of colleagues in collaboration with the nurse educator role. The benefits that this role brought to the critical care area led to the introduction of a similar service for non-critical care areas, particularly in the context of clinical deterioration of patients or for patients recently discharged from the ICU, with the development of critical care outreach or ICU liaison nurse roles (see Chapter 2 for further discussion of these services).

In practice, the role of clinical consultant and that of an advanced practice nurse or nurse practitioner can become blurred, with hospital administrators believing that one role can replace the other. Clearly, however, the consultant’s role has a broader portfolio, with a focus on supporting clinical colleagues in providing safe, quality patient care, while the role of advanced practice nurse or nurse practitioner has a direct patient care focus (see below).

ADVANCED PRACTICE NURSE/NURSE PRACTITIONER

Processes for authorisation to practise as a nurse practitioner (NP) have been introduced by professional registration agencies in Australia and New Zealand, with similar roles present in the UK and USA prior to this. Nurse practitioner roles in ‘critical care’ (or high dependency) range from emergency department practitioners through to community-based cardiac failure specialists, and, as noted above for the nurse consultant’s role, often lack clarity regarding their scope of practice. Factors influencing the establishment of these roles include the accrediting process, defining the scope of practice through specific clinical practice guideline development, prescribing rights and the prevailing medical views, and the level of support provided by health service administrators for the implementation, development and evaluation of the role. Advanced practice roles in the emergency department are the most well-established in the critical care domain (see Chapter 22).

CLINICAL DECISION MAKING

Clinical decision making is integral to critical care nursing practice and forms part of the clinical reasoning process. Clinical reasoning is the cognitive processes and strategies that nurses use to understand the significance of patient data, to identify and diagnose actual or potential patient problems, and to make clinical decisions to assist in problem resolution and to achieve positive patient outcomes.

Clinical information and prior knowledge are therefore used to inform a decision. This section focuses on the decision-making component of clinical reasoning. A brief overview of the theoretical perspectives that have been used to understand clinical decision making is provided and then studies that focus on critical care nursing are reviewed. Finally, strategies for developing clinical decision-making skills are provided.

THEORETICAL PERSPECTIVES ON DECISION MAKING

There are numerous theoretical perspectives on decision making, but they can be grouped into two main categories:

1. analytical or rationalist
2. intuitive or humanistic.
The analytical approaches arise from a positivist or rationalist perspective and focus on analysing behaviour and the steps involved in problem solving. Some of the specific theories that fall into this category include information-processing theory (IPT)\(^{60}\) and decision analysis theory (DAT).\(^{60}\)

Fundamental to IPT is the premise that reasoning consists of a relationship between the problem solver and the context within which the problem occurs. This theory asserts that relevant information is stored in one’s memory and that problem solving occurs when the problem solver retrieves information from both short- and long-term memory. Additionally, IPT claims that there are limits to the amount of information that can be processed at any given time. Thus, IPT focuses on understanding how information is gathered, stored and retrieved. DAT focuses on the use of decision trees, mathematical formulas and other techniques to determine the likelihood of meaningful clinical data. These rationalist approaches focus on diagnosing a problem, intervening and evaluating the outcome.\(^{60}\)

Contrary to the analytical approaches, intuitive approaches (also termed humanistic, hermeneutic or phenomenological) focus on the importance of intuitive knowledge and context in clinical decision making.\(^{60,62,63}\) That is, expert intuition develops with experience and can be used to make complex decisions. Both intuitive knowledge and analytical reasoning contribute to clinical decisions.\(^{63}\) Intuitive approaches to decision making therefore focus on understanding the development of intuition, the role of experience and articulating how nurses use intuition to make a decision. In addition, Australian authors\(^{64}\) have described a naturalistic framework to examine critical care nurses’ decision making, describing it as a way of considering how people use their experience when making real-life decisions.

**Research on Decision Making in Critical Care Nursing**

Critical care nursing practice has been the focus of many studies on decision making. As multiple, complex decisions are made in rapid succession in critical care, it is an ideal setting for studying clinical decision making.\(^{62}\) The seminal work by Benner and colleagues\(^{60,63,65}\) focused on critical care nurses. Table 1.1 summarises 10 studies (11 publications) conducted on critical care nurses’ decision making over the past decade.

Of note, 7 of the 10 studies were conducted in Australia, with two multinational studies also including Australia. All but two studies\(^{66,67}\) used qualitative approaches such as observation, interviewing and thinking aloud. Two studies reported the types and frequency of decisions made during the time period and identified that critical care nurses’ decisions were related to interventions and communication.\(^{61,68}\) Evaluation,\(^{51}\) assessment, organisation and education.\(^{68}\) A further study demonstrated that critical care nurses generate one or more hypotheses about a situation prior to decision making.\(^{69}\) All three studies highlighted the importance of enabling expert nurses to provide a narrative account of their practice.

Other studies indicated that experienced and inexperienced nurses differ in their decision-making skills,\(^{65,70,71}\) and that role models or mentors are important in assisting to develop decision making skills.\(^{72}\)

**Recommendations for Developing Clinical Decision Making Skills**

Several strategies can be used to help critical care nurses to develop their clinical decision-making abilities (Table 1.2).\(^{71,72}\) These strategies can be used by nurses at any level to develop their own decision-making skills, or by educators in planning educational sessions.

In summary, clinical decision making is a component of the clinical reasoning process that is part of everyday critical care nursing practice. It involves gathering and analysing information in order to arrive at a decision about a particular course of action. The analytical or rationalist perspective of clinical decision making focuses on analysing behaviours and the steps in solving a problem, while the intuitive or humanistic approach centres on intuitive knowledge and the context of the decision. In this specialty area nurses are making clinical decisions at a rate of two to three per minute.\(^{61,68}\) Given this, it is important that clinical decision-making skills be developed through experience, training and education. Previous research has demonstrated that a number of strategies, such as case studies and reflection on action, can be used to assist nurses in developing these important skills.

**Leadership in Critical Care Nursing**

Effective leadership within critical care nursing is essential at several organisational levels, including the unit and hospital levels, as well as within the specialty on a broader professional scale. The leadership required at any given time and in any specific setting is a reflection of the surrounding environment. Regardless of the setting, effective leadership involves having and communicating a clear vision, motivating a team to achieve a common goal, communicating effectively with others, role modelling, creating and sustaining the critical elements of a healthy work environment and implementing change and innovation.\(^{76-79}\) Leadership at the unit and hospital levels is essential to ensure excellence in practice, as well as adequate clinical governance. In addition to the generic strategies described above, it is essential for leaders in critical care units and hospitals to demonstrate a patient focus, establish and maintain standards of practice and collaborate with other members of the multi-disciplinary healthcare team.\(^{76}\)

Leadership is essential to achieve the growth and development in our specialty and is demonstrated through such activities as conducting research, producing publications, making conference presentations, representation on relevant government and healthcare councils and committees, and participation in organisations such as the ACCCN and the WFCN. As outlined earlier in this chapter, we have seen the field of critical care grow from early ideas and makeshift units to a well-developed and
### TABLE 1.1 Australian and international critical care nurses decision-making research

<table>
<thead>
<tr>
<th>Author [Country]</th>
<th>Sample</th>
<th>Data collection</th>
<th>Findings</th>
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</thead>
</table>
| Bucknall, 2000 [Australia] | 18 CC nurses (range of levels and experiences; all had completed a CC course) | Observation (2-hour periods) | Three types of decision:  
- evaluation (51%)  
- communication (30%)  
- intervention (19%)  
Average: 238 decisions/2 hours (i.e. 2.0/min) |
| Currey & Worrall-Carter, 2001 [Australia] | 12 CC nurses with 2+ years’ CC experience from 3 units | Clinical decision record (of 2-hour periods) and focus groups | Five types of decision:  
- intervention (40%)  
- communication (26%)  
- assessment (19%)  
- organisation (13%)  
- education (2%)  
Average: 395 decisions/2 hours (i.e. 3.3/min) |
| Aitken, 2003 [Australia] | 8 expert CC nurses with 5+ years’ CC experience | Thinking aloud (2-hour periods) and follow-up interview | Hypotheses developed as a framework for decision making  
A combination of strategies used to gather data |
| Currey & Botti, 2006 [Australia] | CC nurses from 2 metropolitan hospitals; 18 inexperienced (≤3 years) and 20 experienced CC nurses (>3 years). | Observation followed by semi-structured interview | Clinical processes that affected decision making following the settling in phase post cardiac surgery were:  
- handover from anaesthetists  
- settling in procedures  
- collegial assistance.  
15 nurses (13 inexperienced) felt daunted by decision making while 7 nurses (1 inexperienced) felt challenged with a sense of being stimulated, excited and positive. |
| Currey, Browne & Botti (2006) [Same study as above] [Australia] | Same as above | Observation in 2 phases: 1st phase comprised unstructured, narrative observational data; 2nd phase comprised a 2-page structured observation checklist. Followed up by interview. | Quality of haemodynamic decision making in the 2 hours post cardiac surgery was influenced by decision complexity, nurses’ level of experience, and forms of decision support provided by nursing colleagues.  
Experience was a dominant influence in recognising patterns of haemodynamic cues that were suggestive of complications.  
Adherence to evidence-based practice also influenced quality of decision making. |
| Aitken, 2008 [Australia] | 7 CC nurses with a CC qualification, >5 years CC experience, and working ≥2 days/week | Observation and/or thinking aloud, along with follow-up interviews | A range of concepts related to the assessment and management of sedation needs. Assessment included:  
- patient’s condition  
- response to therapy  
- multiple sources of information during assessment  
- consideration of relevant history  
- consideration of the impact on physiology and pathophysiology  
- implications of treatment  
- options in treatment. |
| Hough, 2008 [USA] | 15 CC nurses from 4 units, with varied experience and education levels | In-depth, semi-structured interviews | The presence of a role model or mentor to help guide the ethical decision-making process, through reflection-in-action, was critical for focused ethical discourse and the decision making.  
Enhanced ethical decision making occurred through experiential learning. |
| Thompson, 2008 [various countries] | 245 Dutch, UK, Canadian and Australian registered nurses working in surgical, medical, ICU or HDU | Vignettes with decision whether or not to contact a senior nurse/doctor. The proportion of true positives (the patient is at risk of a critical event and the nurse takes action) and false positives (the nurse takes action when it was not warranted) was calculated. | Time pressure significantly reduced the nurses’ decision tendency to intervene.  
There were no statistically significant differences in decision-making ability between years of generic clinical experience.  
There were statistically significant differences in decision-making ability between years of critical care experience when participants were not under time pressure: those with greater critical care experience performed better.  
Under time pressure, there were no differences in decision-making ability between years of critical care experience. |
leadership styles vary and are influenced by the mission and values of the organisation as well as the values and beliefs of individual leaders. These styles of leadership are described in many different ways, sometimes using theoretical underpinnings such as ‘transactional’

TABLE 1.1, Continued

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<thead>
<tr>
<th>Author [Country]</th>
<th>Sample</th>
<th>Data collection</th>
<th>Findings</th>
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</table>
| Hoffman, 200971 [Australia] | 8 CC nurses: 4 novice and 4 expert                                     | Thinking aloud (during 2-hour period of care); interview | Cue usage and clustering during decision making:  
  ● Expert nurses collected 89 different cues, while novices collected 49 different cues.  
  ● Expert nurses clustered a greater number of cues when making decisions regarding the patient’s haemodynamic status.  
  ● Expert nurses were more proactive in collecting relevant cues to anticipate problems and make decisions. |
| Ramezani-Badr, 2009104 [Iran] | 14 CC nurses from 4 hospitals, currently working in the CCU, with ≥3 years CC experience and holding at least a bachelor of nursing. | In-depth, semi-structured interviews | 3 themes were involved in reasoning strategies:  
  ● intuition  
  ● recognising similar situations  
  ● hypothesis testing.  
  3 other themes regarding participants’ criteria to make decisions:  
  ● patient’s risk-benefits  
  ● organisational necessities (i.e. complying with organisational policy even if it meant they were capable of doing more)  
  ● complementary sources of information (e.g. research papers and pharmacology texts). |
| Thompson, 200966 [Various countries] | 245 Dutch, UK, Canadian and Australian registered nurses working in surgical, medical, ICU or HDU. | Judgement classification systems, Continuous (0-100) ratings or dichotomous ratings on 3 nursing judgements were used | Critical care experience was associated with estimates of risk, but not with the decision to intervene.  
Nurses varied considerably in their risk assessments, this being partly explained by variability in weightings given to information.  
Information was synthesised in non-linear ways that contributed little to decisional accuracy. |

TABLE 1.2 Strategies to develop clinical decision-making skills

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Description</th>
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| Iterative hypothesis testing74  | Description of a clinical situation for which the clinician has to generate questions and develop hypotheses; with additional questioning the clinician will develop further hypotheses. Three phases:  
  1. asking questions to gather data about a patient  
  2. justifying the data sought  
  3. interpreting the data to describe the influence of new information on decisions. |
| Interactive model74             | Schema (mental structures) used to teach new knowledge by building on previous learning. Three components:  
  1. advanced organisers – blueprint that previews the material to be learned and connects it to previous materials  
  2. progressive differentiation – a general concept presented first is broken down into smaller ideas  
  3. integrative reconciliation – similarities and differences and relationships between concepts explored. |
| Case study75                    | Description of a clinical situation with a number of cues, followed by a series of questions. Three types:  
  1. stable – presents information, then asks clinicians about it  
  2. dynamic – presents information, asks the clinicians about it, presents more information, asks more questions  
  3. dynamic with expert feedback – combines the dynamic method with immediate expert feedback. |
| Reflection on action76          | Clinicians are asked to reflect on their actions after a particular event. Reflection focuses on clinical judgments made, feelings surrounding the actions and the actions themselves. Reflection on action can be undertaken as an individual or group activity and is often facilitated by an expert. |
| Thinking aloud74                | A clinical situation is provided and the clinician is asked to think aloud, or verbalise his/her decisions. Thinking aloud is generally facilitated by an expert and can be undertaken individually or in groups. |

highly organised international specialty in the course of half a generation. Such development would not have been possible without the vision, enthusiasm and commitment of many critical care leaders throughout the world.
and ‘transformational’ and sometimes by using leadership characteristics. Regardless of the terminology in use, some common principles can be expressed. Desired leadership characteristics include the ability to:

- articulate a personal vision and expectations
- act as a catalyst for change
- establish and implement organisational standards
- model effective leadership behaviours through both change processes and stable contexts
- monitor practice in relation to standards and take corrective action when necessary
- recognise the characteristics and strengths of individuals, and stimulate individual development and commitment
- empower staff to act independently and interdependently
- inspire team members to achieve excellence

Personal characteristics of an effective leader, regardless of the style, include honesty, integrity, commitment and credibility, as well as the ability to develop an open, trusting environment. Effective leaders inspire their team members to take the extra step towards achieving the goals articulated by the leader and to feel that they are valued, independent, responsible and autonomous individuals within the organisation. Members of teams with effective leaders are not satisfied with maintaining the status quo, but believe in the vision and goals articulated by the leader and are prepared to work towards achieving a higher standard of practice.

Although all leaders share common characteristics, some elements vary according to leadership style. Different styles – for example, transactional, transformational, authoritative or laissez faire – incorporate different characteristics and activities. Having leaders with different styles ensures that there is leadership for all stages of an organisation’s operation or a profession’s development. A combination of leadership styles also helps to overcome team member preferences and problems experienced when a particularly visionary leader leaves. The challenges often associated with the departure of a leader from a healthcare organisation are generally reduced in the clinical critical care environment, where a nursing leader is usually part of a multidisciplinary team, with resultant shared values and objectives.

**CLINICAL LEADERSHIP**

Effective critical care nurses demonstrate leadership characteristics regardless of their role or level of practice. Leadership in the clinical environment incorporates the general characteristics listed above, but has the added challenges of working within the boundaries created by the requirements of providing safe patient care 24 hours a day, 7 days a week. It is therefore essential that clinical leaders work within an effective interdisciplinary model, so that all aspects of patient care and family support, as well as the needs of all staff, are met. Effective clinical leadership of critical care is essential in achieving:

- satisfied staff, with a high level of retention
- development of staff through an effective coaching and mentoring process

Effective clinical leaders build cohesive and adaptive work teams. They also promote the intellectual stimulation of individual staff members, which encourages the analysis and exploration of practice that is essential for evidence-based nursing.

Clinical leadership is particularly important in contemporary critical care environments in times of dynamic change and development. We are currently witnessing significant changes in the organisation and delivery of care, with the development of new roles such as nurse practitioner (see this chapter) and liaison nurse (see Chapter 3), the introduction of services such as rapid response systems, including medical emergency teams (see Chapter 3), and the extension of activities across the care continuum (see Chapter 4). Effective clinical leadership ensures that:

- critical care personnel are aware of, and willing to fulfil, their changing roles
- personnel in other areas of the hospital or outside the hospital recognise the benefits and limitations of developments, are not threatened by the developments and are enthusiastic to use the new or refined services
- patients receive optimal quality of care.

The need to provide educational opportunities to develop effective clinical leadership skills is recognised. Although not numerous in number or variety, programs are beginning to be available internationally that are designed to develop clinical leaders. Factors that influence leadership ability include the external and internal environment, demographic characteristics such as age, experience, understanding, stage of personal development including self-awareness capability, and communication skills. In relation to clinical leadership, these factors can be developed only in a clinical setting, so development of clinical leaders must be based in that environment. Development programs based on mentorship are superbly suited to developing those that demonstrate potential for such capabilities.

Mentorship has received significant attention in the healthcare literature and has been specifically identified as a strategy for clinical leadership development. Although many different definitions of mentoring exist, common principles include a relationship between two people with the primary purpose of one person in the relationship developing new skills related to their career. Mentoring programs can be either formal or informal and either internal or external to the work setting. Mentorship involves a variety of activities directed towards facilitating new learning experiences for the mentee, guiding professional development and career decisions, providing emotional and psychological support and assisting the mentee in the socialisation process both within and outside the work organisation to build professional networks. Role modelling of occupational and professional skills and characteristics is an important
component of mentoring that helps develop future clinical leaders.89,92

DEVELOPING A BODY OF KNOWLEDGE

Development of a body of knowledge is a key characteristic of both professions93-95 and the specialties within professions. One criterion for a specialty identified over two decades ago by the International Council of Nurses (ICN)96 is that it is based on a core body of nursing knowledge that is being continually expanded and refined by research. Importantly, the ICN acknowledges that mechanisms are needed to support, review and disseminate research.

RESEARCH

As noted above, research is fundamental in the development of nursing knowledge and practice. Research is a systematic inquiry using structured methods to understand an issue, solve a problem or refine existing knowledge. Qualitative research involves in-depth examination of a phenomenon of interest, typically using interviews, observation or document analysis to build knowledge and enable depth of understanding. Qualitative data analysis is in narrative (text) form and involves some form of content or thematic analysis, with findings generally reported as narrative (where words rather than numbers describe the research findings). In contrast, quantitative research involves the measurement (in numeric form) of variables and the use of statistics to test hypotheses. Results of quantitative research are often reported in tables and figures, identifying statistically significant findings. One particular type of quantitative research, the clinical trial (randomised controlled trial, or RCT), is used to test the effect of a new nursing intervention on patient outcomes. In essence, clinical trials involve:

1. randomly allocating patients to receive either a new intervention (the experimental or intervention group) or an alternative or standard intervention (the control group)
2. delivering the intervention or alternative treatment
3. measuring an a priori identified patient outcome.

Statistical analyses are used to determine if the new intervention is better for patients than the alternative treatment.

Mixed methods research have now emerged as an approach that integrates data from qualitative and quantitative research at some stage in the research process.97 In mixed methods approaches, researchers decide on both priority and sequence of qualitative and quantitative methods. In terms of priority, equal status may be given to both approaches. Priority is indicated by using capital letters for the dominant approach, followed by the symbols + and → to indicate either concurrent or sequential data collection. For example:

- QUAL + QUANT: both approaches are given equal status and data collection occurs concurrently.
- QUAL + quant: qualitative methods are the dominant approach and data collection occurs concurrently.
- QUAL → quant: the qualitative study is given priority and qualitative data collection will occur before quantitative data collection.

Irrespective of which type of research design is used, there are a number of common steps in the research process (Table 1.3), consisting of three phases: planning for the research, undertaking the research and analysing and reporting on the research findings.

Clinical research and the related activities of unit-based quality improvement are integral components in the practice, education and research triad.98 Partnerships

### Table 1.3 Steps in the research process

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
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<tbody>
<tr>
<td>Identify a clinical problem or issue.</td>
<td>Clinical experience and practice audits are two ways that clinical issues or problems are identified.</td>
</tr>
<tr>
<td>Review the literature.</td>
<td>A comprehensive literature review is vital to ensure that the issue or problem has not yet been solved and that the proposed research will fill a gap in knowledge.</td>
</tr>
<tr>
<td>State a clear research question.</td>
<td>A concise question includes both the phenomenon of interest and the patient population.</td>
</tr>
<tr>
<td>Write a research proposal.</td>
<td>Clear description of the proposed research design and sample and a plan for data collection and analysis. Ethical considerations and the required resources (i.e. budget) for the research are identified.</td>
</tr>
<tr>
<td>Secure resources.</td>
<td>Resources such as funding for supplies and research staff, institutional support and access to experienced researchers are needed to ensure a study can be completed.</td>
</tr>
<tr>
<td>Obtain ethics approvals.</td>
<td>Approval of the proposed research by a human research ethics committee (HREC) is required before the study can commence.</td>
</tr>
<tr>
<td>Conduct the research.</td>
<td>Adequate time for recruitment of participants and data collection are crucial to ensure that accurate data are obtained.</td>
</tr>
<tr>
<td>Disseminate the research findings.</td>
<td>Conference presentations and journal publications are two common ways that research findings are disseminated and are vital to ensure that both nursing practice and nursing knowledge continue to be developed.</td>
</tr>
</tbody>
</table>
between clinicians and academics, and the implementation of clinical academic positions, including at the professorial level, provide the necessary infrastructure and organisation for sustainable clinical nursing and multidisciplinary research. A strong research culture in critical care nursing is evident in Australasia, transcending geographical, epistemological and disciplinary boundaries to focus on the core business of improving care for critically ill patients. Our collective aim is to develop a sustainable research culture that incorporates strategies that facilitate communication, cooperation, collaboration and coordination both between researchers with common interests and with clinicians who seek to use research findings in their practice. A sample of a guiding structure for a coherent research program that highlights the major issues affecting critical care nursing practice is illustrated in Figure 1.2, with identified themes and topic exemplars.

A number of resources are available to critical care nurses interested in undertaking research. For example, the ACCCN provides funding for research on a competitive basis, with its Research Advisory Panel assessing grant applications and providing feedback to applicants. The Intensive Care Foundation, whose members are drawn from the Australia and New Zealand Intensive Care Society (ANZICS), the College of Intensive Care Medicine (CICM) and ACCCN, also has a research funding scheme. Additionally, the ANZICS Clinical Trials Group (CTG) holds regular meetings where potential research can be discussed and research proposals refined. There is great value in receiving a critical review of proposed research before the study is undertaken, as assessors’ comments help to refine the research plan.

Over the years, various groups have identified priorities for critical care research. A review of this literature identified the following research priorities: nutrition support, infection control, other patient care issues, nursing roles, staffing and end-of-life decision making.

While not all nurses are expected to conduct research, it is a professional responsibility to use research in practice. Chapter 3 provides a detailed description of research utilisation approaches, with a description of evidence-based practice and the use of evidence-based clinical practice guidelines. In addition, each chapter in this text contains a research critique to assist nurses in developing critical appraisal skills, which will help to determine whether research evidence should change practice.

**SUMMARY**

This chapter has provided a context for subsequent chapters, outlining some key issues, principles and concepts for studying and practising nursing in a range of critical care areas. Critical care nursing now encompasses a wide and ever-expanding scope of practice. The previous focus on patients in ICU only has given way to a broader concept of caring for an individual located in a variety of clinical locations across a continuum of critical illness.

The discipline of critical care nursing, in collaboration with multidisciplinary colleagues, continues to develop to meet the expanding challenges of clinical practice in today’s healthcare environment. Critical care clinicians also continue their professional development individually, focusing on clinical practice development, education and training, and on quality improvement and research activities, to facilitate quality patient and family care during a time of acute physiological derangement and emotional turmoil. The principles of decision making and clinical leadership at all levels of practice serve to enhance patient safety in the critical care environment.

**ONLINE RESOURCES**

American Association of Critical-Care Nurses, www.aacn.org
Annual Scientific Meeting on Intensive Care, www.intensivecareasm.com.au
Australian College of Critical Care Nurses, www.acccn.com.au
British Association of Critical Care Nurses, www.baccn.org.uk
College of Intensive Care Medicine, www.cicm.org.au
Intensive Care Foundation (Australia and New Zealand), www.intensivecareappeal.com
King’s College, London, www.kcl.ac.uk/schools/nursing
Abstract

Aims

This study was designed to examine the decision-making processes that nurses use when assessing and managing sedation for a critically ill patient, specifically the attributes and concepts used to determine sedation needs and the influence of a sedation guideline on the decision-making processes.

Background

Sedation management forms an integral component of the care of critical care patients. Despite this, there is little understanding of how nurses make decisions regarding assessment and management of intensive care patients’ sedation requirements. Appropriate nursing assessment and management of sedation therapy is essential to quality patient care.

Design

Observational study.

Methods

Nurses providing sedation management for a critically ill patient were observed and asked to think aloud during two separate sessions for two hours of care. Follow-up interviews were conducted to collect data from five expert critical care nurses pre- and post-implementation of a sedation guideline. Data from all sources were integrated, with data analysis identifying the type and number of attributes and concepts used to form decisions.

Results

Attributes and concepts most frequently used related to sedation and sedatives, anxiety and agitation, pain and comfort and neurological status. On average each participant raised 48 attributes related to sedation assessment and management in the preintervention phase and 57 attributes postintervention. These attributes related to assessment (pre, 58%; post, 65%), physiology (pre, 10%; post, 9%) and treatment (pre, 31%; post, 26%) aspects of care.

Conclusions

Decision making in this setting is highly complex, incorporating a wide range of attributes that concentrate primarily on assessment aspects of care.

Relevance to clinical practice

Clinical guidelines should provide support for strategies known to positively influence practice. Further, the education of nurses to use such guidelines optimally must take into account the highly complex iterative process and wide range of data sources used to make decisions.

Critique

The study aim was to identify the concepts and attributes used by Australian critical care nurses in their decision making before and after the implementation of a nurse-initiated sedation protocol. A number of educational strategies were used to support implementation of the sedation protocol including: individual and group education; protocol and its supporting evidence placed on the intranet; laminated copies of the protocol available in the patient care areas; poster reminders; and audit and feedback. The aims of the study were easy to identify and clearly stated, but the inclusion of definitions of attributes and concepts would have been helpful, because some phrases (such as level of sedation, comfort and level of consciousness) were labelled as both attribute and concept.

Three methods of data collection were used: ‘think aloud’, observation and interviews. Specifically, during the think-aloud approach, nurses wore a collar-mounted microphone attached to an audio-recorder and were asked to verbalise their thought processes during the data collection period. At the same time, an observer recorded the activities that the nurses were undertaking while thinking aloud. A follow-up interview was then undertaken to help clarify the activities that were observed. Two observers were used to collect the data. The qualitative nature of the study and the data collection methods are accepted methods to examine decision-making processes. The researchers are to be commended for training the participants in the think-aloud method and for piloting various forms of observational data collection.

The data from the think-aloud method and the observations were analysed independently by the data collector who had collected the data for that particular nurse. As part of this analysis, the think-aloud, observation and interview data were integrated for each nurse. The actual analysis involved identifying concepts and attributes related to three predefined categories: assessment, physiology and treatment. All analyses were assessed by the chief investigator and any differences were resolved by consensus.

The sample size – five nurses observed twice each (i.e. before and after implementation of the sedation protocol) and two nurses observed once in the pilot study – is appropriate. It is obvious that a very large amount of data was generated. While selection criteria were described to identify ‘expert’ nurses, and included the need to have critical care qualifications and more than five years experience, the fact that they self-nominated as expert means that it is always possible that some would not have been judged to be ‘expert’ by their peers and superiors. It was not clear, however, how the data of the two pilot nurses was actually incorporated into the findings. That is, as their data was only pre-protocol, the reported number of attributes after protocol was implemented could be expected to be influenced by two fewer participants. This issue was not addressed in the report.

The fact that a number of strategies were used to educate the nurses about the sedation protocol should be applauded, as it is generally recognised that didactic education is not effective in getting clinicians to use guidelines with multi-mode strategies, as in this study. The method used for analysing data – that is, having the observers analyse the data they collected, and the investigator also assessing the analysis – is a strength of the study. The researchers note that they integrated the think-aloud, observation and interview data but do not elaborate how this was done, possibly because of the word limit imposed by the journal. Anyone interested in how this actually occurred would have to contact the researchers. In their discussion, the researchers note that they were not able to determine the path between attributes and concepts (i.e. which came first) or the actual decision-making methods used. They note, however, that that they were able to identify relationships between attributes and concepts. They suggest that their findings can be used by educators when designing educational activities such as concept mapping to help develop decision-making skills in nurses. The findings were clearly reported, the table was easy to understand and the discussion considered the implications of the main findings. Overall, this study provides additional evidence about the concepts and attributes that critical care nurses draw on when they are making decisions about sedation.
Learning activities

1. Consider the leaders to whom you are exposed in your work environment and identify the characteristics they display that influence patient care. Reflect on whether these are characteristics that you possess or how you might develop them.

2. Mentors are generally individuals who have excelled in their chosen profession and who are willing to share their experiences and expertise with others. Think about your aspirations in your career as a critical care nurse. With the help of others, try to identify a potential mentor. Consider asking this person to meet you on a regular basis to discuss your professional goals and your strategies to meet these goals and to provide you with advice.

3. Review the strategies outlined in Table 1.2 and develop a plan of how you might improve your clinical decision-making skills. Approach a mentor in your clinical environment and ask him/her to provide feedback over a period of months on any changes observed in your clinical decision-making skills.

4. Consider the role that you have within critical care and examine the influence that research has on that role. How might you use research to inform your practice more effectively? Are there strategies that you could implement to influence the research that is undertaken so that it meets your needs?

5. Reflect on your practice in terms of the ACCCN competency domains14 of professional practice; reflective practice; enabling; clinical problem solving; teamwork; and leadership. To what extent does your current practice address these domains? What strategies could you use to enhance your practice in these domains?

FURTHER READING


REFERENCES


4. Wiles V, Daffurn K. There’s a bird in my hand and a bear by the bed – I must be in ICU. The pivotal years of Australian critical care nursing. Melbourne: Australian College of Critical Care Nurses, 2002.


