

Supplementary Table 1. Data extraction table: main features and results of the studies included in the literature review.

Title			
<i>Reconceptualizing the curriculum for Malaysian Advanced Nursing Education: an Outlook on Mechanical Ventilation Weaning Pedagogy. [29]</i>			
Author	<i>Alias et al.</i>	Year of publication	2022
Periodical	<i>Front Public Health</i>	Country	Malaysia
Setting	Critical care/Intensive care	Study design	Editorial
Outcome and main results	Aim of the study: proving the necessity to reconceptualize a training program for mechanical ventilation weaning in Malaysia after nurses' training demand, starting from previous studies, pertinent theories, and best practice.		
Title			
<i>The development of critical care nursing education in Zambia. [31]</i>			
Author	<i>Carter et al.</i>	Year of publication	2020
Journal	<i>British journal of nursing</i>	Country	Zambia
Setting	Critical care/Intensive Care	Study design	Literature review
Timing	-	Tool	-
Sample size	14 articles		

Outcome and main results	Supporting and validating the current intensive care nursing course and preparing a Bachelor of Science (BSc) program for intensive care nurses.		
Title			
<i>Investigating Emergency Department Nurses' Educational Needs and Exploring Strategies to Meet Challenges Against Management of These Needs: A Qualitative Study. [15]</i>			
Author	Azizi	Year of publication	2023
Journal	<i>Shiraz E Medical Journal</i>	Country	Iran
Setting	Critical care/Emergency room	Study design	Qualitative study
Timing	January 2020 -March 2021	Tool	Structured questionnaire and interviews
Sample size	15 nurses		
Outcome and main results	Identification of emergency department nurses' training needs through specific strategies and emergence of the necessity of complete and continuing training to fulfill them.		
Title			
<i>Permanent education in health in an intensive care unit: the perception of the nurses. [1]</i>			
Author	Citoula Paim <i>et al.</i>	Year of publication	2015

Journal	<i>Revista de Pesquisa: Cuidado e Fundamental</i>	Country	Brazil
Setting	Critical care/Intensive care	Study design	Qualitative study
Timing	June – August 2013	Tool	Questionnaire with open-ended questions
Sample size	5 nurses		
Outcome and main results	Surveying ICU nurses' perception on the Permanent Education process with the aim of implementing it. Results: necessity to outline strategies for the work process qualification based on a permanent education process.		
Title			
<i>Medication errors in intensive care units: nurses' training needs. [16]</i>			
Author	Di Simone <i>et al.</i>	Year of publication	2016
Journal	<i>Emergency nurse: the journal of the RCN Accident and Emergency Nursing Association</i>	Country	Italy

Setting	Critical care/Intensive care	Study design	Descriptive study
Timing	March – September 2015	Tool	Structured questionnaire
Sample size	123 nurses		
Outcome and main results	Describing which elements of knowledge, training, behavior, and attitude can prevent errors in intensive care units during the administration of intravenous medication. Results: intensive care nurses should regularly update their knowledge, showing that educational interventions effectively increase knowledge and reduce errors.		
Title			
<i>A description of the self-perceived educational needs of emergency nurses in Durban, KwaZulu-Natal, South Africa. [9]</i>			
Author	Dulandas R, Brysiewicz P.	Year of publication	2018
Journal	<i>African Journal of Emergency Medicine</i>	Country	South Africa
Setting	Critical care/Emergency	Study design	Quantitative descriptive study
Timing	July 2015	Tool	Self-administered structured questionnaire
Sample size	128 nurses		

Outcome and main results	Surveying self-perceived training needs and preparation. Results: most of the sample perceives themselves as highly competent in basic skills but less competent in advanced skills. The study detects the necessity of training courses focused on specific skills and shows increasing need for continuing training.
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Title
The effect of education on the nursing care quality of patients who are under mechanical ventilation in ICU ward. [17]

Author	Geravandi <i>et al.</i>	Year of publication	2018
Journal	<i>Data in brief</i>	Country	Iran
Setting	Critical care/Intensive care	Study design	Descriptive study
Timing	2015	Tool	Structured questionnaire
Sample size	20 nurses		

Outcome and main results	Investigating the effect of education on the quality of nursing assistance to patients under mechanical ventilation. Results: the nurses involved in the research expressed relevant opinions for each examined method which may serve as a basis to create specific and focused training courses.
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Title
Developing and testing the standard of practice and evaluation of critical-care-nursing tool (SPECT) for graduates of critical care nurse education programs. [32]

Author	Gill <i>et al.</i>	Year of publication	2015
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Journal	<i>Australian Critical Care</i>	Country	Australia
Setting	Critical care/Intensive care	Study design	Trial
Timing	July - November 2013	Tool	-
Sample size	55 nurses		
Outcome and main results	Multi-phase project that aims at developing practice standards and a critical care clinical evaluation tool (SPECT) to measure practice itself. The SPECT seems to have clinical feasibility, preliminary validity, and reliability; it also provides clear definition for the expected practice level for graduates of a critical care training program.		
Title			
<i>Assessment of Continuing Education Needs Among Critical Care Nurses in Remote Québec, Canada. [30]</i>			
Author	Gosselin <i>et al.</i>	Year of publication	2020
Journal	<i>Journal of continuing education in nursing</i>	Country	Canada
Setting	Critical care/Intensive care	Study design	Descriptive study
Timing	May - June 2018	Tool	Structured questionnaire
Sample size	78 nurses		

Outcome and main results	Study on intensive care nurses' continuing training needs: the majority believed that their continuing educational needs were not fulfilled and underlined factors that hindered participation to the activity of continuing training, also suggesting how to remove them.		
Title			
<i>Education on invasive mechanical ventilation involving intensive care nurses: a systematic review.</i>			
[18]			
Author	Guilhermino <i>et al.</i>	Year of publication	2018
Journal	<i>Nursing in critical care</i>	Country	Australia
Setting	Critical care/Intensive care	Study design	Systematic review
Timing	2001-2016	Tool	-
Sample size	12 studies included		
Outcome and main results	A systematic review was carried out with the aim of determining whether ICU nurses' continuing training programs on invasive mechanical ventilation are effective to improve patients' outcomes. Results: there is limited evidence of the efficacy of continuing training programs on mechanical ventilation and it is therefore necessary to carry out more well-designed studies to confirm the real efficacy of training focused on the matter.		
Title			

Perceptions of an educational programme for registered nurses who work at non-major trauma services in Victoria, Australia: The Nursing Emergency External Trauma Programme. [19]

Author	Ireland <i>et al.</i>	Year of publication	2017
Journal	<i>Australasian Emergency Nursing Journal</i>	Country	Australia
Setting	Critical care/Emergency	Study design	Descriptive study
Timing	2016	Tool	Structured questionnaire with mixed questions
Sample size	24 nurses		
Outcome and main results	The aim of the study is to report the participants' perception of an educational program for management of major trauma. The participants stated that the day was useful and valuable since they developed knowledge and skills that increased confidence in assisting traumatized patients.		

Title

Unique Educational Needs of Emergency Nurse Practitioners. [20]

Author	Keough <i>et al.</i>	Year of publication	2016
Journal	<i>Advanced Emergency Nursing Journal</i>	Country	United States of America

Setting	Critical care/Emergency room	Study design	Descriptive studio
Timing	-	Tool	Structured questionnaire
Sample size	163 nurses		
Outcome and main results	The aim of the study is to identify emergency nurses' educational needs. Results: the unique and complex setting of the emergency department requires nurses to receive a unique combination of education and standardized skills to meet the needs of practice, by questioning the utility and efficacy of a standardized educational curriculum.		
Title			
<i>Nursing competency and educational needs for clinical practice of Korean nurses. [2]</i>			
Author	Sun-Ok Kim and Yun-Jung Choi	Year of publication	2019
Journal	<i>Nurse Education in Practice</i>	Country	South Korea
Setting	Critical care/Intensive care	Study design	Descriptive study
Timing	-	Tool	Structured questionnaire
Sample size	211 nurses		
Outcome and main results	Aim: investigating nursing skills and educational needs that are necessary to provide basic evidence for a developing nursing training program.		

	Results: ethical nursing competence was the highest while scientific nursing competence was the lowest. In general, the study shows the importance of supporting nurses through effective clinical nursing training based on evidence and on the educational needs expressed by nurses themselves.
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Title
A Cross-sectional Study of Self-Perceived Educational Needs of Emergency Nurses in Two Tertiary Hospitals in Nairobi, Kenya. [21]

Author	Ndung'u <i>et al.</i>	Year of publication	2022
Journal	<i>Journal of Emergency Nursing</i>	Country	Kenya
Setting	Critical area/Emergency	Study design	Cross-sectional descriptive study
Timing	2019	Tool	Structured questionnaire
Sample size	84 nurses		
Outcome and main results	Aim: highlighting emergency nurses' specific educational needs. Results: considerable lack of knowledge among nurses in Nairobi for which a continuing professional growth through post-graduate courses is suggested.		

Title
The training needs of Korean intensive care unit nurses regarding delirium. [22]

Author	Roh	Year of publication	2021
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Journal	<i>Intensive & critical care nursing</i>	Country	South Korea
Setting	Critical care/Intensive care	Study design	Cross-sectional descriptive study
Timing	December 1st – 15th 2019	Tool	Online open survey
Sample size	255 nurses		
Outcome and main results	Aim: investigating high-priority training needs by analyzing their importance as perceived by nurses themselves, especially concerning delirium care. New graduate nurses identified the delirium assessment and treatment ability as a high training priority and suggested active educational methods (such as training based on simulation) to improve nurses' skills in recognizing and managing delirium.		
Title			
<i>Training needs detected by nurses in an intensive care unit: a phenomenological study. [12]</i>			
Author	Santana-Padilla <i>et al.</i>	Year of publication	2019
Journal	<i>Enfermeria intensiva</i>	Country	Spain
Setting	Critical care/Intensive care	Study design	Phenomenological descriptive study

Timing	-	Tool	Semi-structured interview with open-ended questions
Sample size	72 nurses		
Outcome and main results	Aim: evaluating the training needs detected by intensive care nurses through their experience and practical knowledge. Results: nurses believe training to be the necessary tool to achieve the skills required in intensive care.		
Title			
<i>The training needs of critical care nurses: a psychometric analysis. [23]</i>			
Author	Santana-Padilla <i>et al.</i>	Year of publication	2022
Journal	<i>Science progress</i>	Country	Spain
Setting	Critical care/Intensive care	Study design	Descriptive study
Timing	October 2017 – October 2018	Tool	Electronical questionnaire
Sample size	568 nurses		
Outcome and main results	This study aims at validating a questionnaire that detects intensive care nurses' training needs in Spain. Results: training needs change according to the increase of care complexity; the factors that should be included in the different training strategies are shown; validation of a tool serving as basis to adapt intensive care nurses' training to clinical reality.		
Title			
<i>Training needs assessment of intensive care nurses in Zabol University of Medical Sciences' Hospitals. [24]</i>			

Author	Vatani <i>et al.</i>	Year of publication	2021
Journal	<i>Journal of education and health promotion</i>	Country	Iran
Setting	Critical care/Intensive care	Study design	Cross-sectional descriptive study
Timing	2019	Tool	Questionnaire with closed-ended questions
Sample size	30 nurses		
Outcome and main results	Identification and definition of intensive care nurses' training priorities through the investigation on the perception of their training needs, followed by a second phase aimed at testing their actual knowledge and skills. Results: training programs should be drafted according to standards and to an in-service continuing training program, in addition to the needs of nurses themselves.		
Title			
<i>Identifying the Educational Needs of Emergency Nurses in Rural and Critical Access Hospitals.</i>			
[28]			
Author	L. Wolf, M. Delao	Year of publication	2013
Journal	<i>Journal of Continuing Education in Nursing</i>	Country	United States of America

Setting	Critical care/Emergency room	Study design	Descriptive study
Timing	-	Tool	Focus group
Sample size	33 nurses		
Outcome and main results	This study was carried out to determine the educational needs and to identify the educational methods that are potentially effective for emergency nurses working in rural and critical access hospitals. Other than identifying the main educational needs, the study also indicates the factors hindering training (for example, educational isolation and limited economical resources).		
Title			
<i>Intensive care unit nurses' perception of the barriers to effective in-service education: A qualitative study.</i> [6]			
Author	Yektatalab <i>et al.</i>	Year of publication	2020
Journal	<i>Journal of Nursing & Midwifery Sciences</i>	Country	Iran
Setting	Critical care/Intensive care	Study design	Qualitative study
Timing	March 2015 - June 2016	Tool	Individual semi-structured interviews and focus group
Sample size	24 nurses		

Outcome and main results	Aim: investigating intensive care nurses' perception of factors hindering effective in-service training. The data analysis indicated three main themes regarding obstacles to in-service training: ineffective teaching methods, inappropriate educational programs' contents, and inappropriate planning.		
Title			
<i>Forensic nursing in South Korea: Assessing emergency nurses' awareness, experience, and education needs. [25]</i>			
Author	Han and Lee	Year of publication	2022
Journal	<i>International Emergency Nursing</i>	Country	Korea
Setting	Critical care/Emergency	Study design	Descriptive study
Timing	August 2020	Tool	Structured questionnaire
Sample size	289 nurses		
Outcome and main results	The study investigates emergency nurses' training needs, regarding forensic nursing. Results show that nurses are aware of the importance of forensic nursing assistance but do not believe to be able to provide proper assistance due to lack of adequate education.		
Title			
<i>Nurses' Educational Needs Assessment for Hemodynamic Monitoring in Intensive Care Units. [26]</i>			
Author	Jeshvaghani <i>et al.</i>	Year of publication	2021

Journal	<i>Journal of Continuing Education in the Health Professions</i>	Country	Iran
Setting	Critical care/Intensive care	Study design	Analytic descriptive study
Timing	-	Tool	Questionnaire
Sample size	100 nurses		
Outcome and main results	The study surveys intensive care nurses' training needs regarding hemodynamic monitoring. Conclusions: it is necessary to implement continuing educational programs, especially concerning clinical reasoning (through methods such as case discussions, simulations, etc.).		
Title			
<i>Nurses' perceptions of education on invasive mechanical ventilation. [27]</i>			
Author	Guilhermino <i>et al.</i>	Year of publication	2014
Journal	<i>Journal of continuing education in nursing</i>	Country	Australia
Setting	Critical care/Intensive care	Study design	Qualitative study
Timing	May 2011	Tool	Questionnaire with open-ended questions
Sample size	160 nurses		

Outcome and main results	The study investigates critical care nurses' perception of their training needs regarding mechanical ventilation. Results: those being interviewed stated that continuing training concerning invasive mechanical ventilation is a priority for new nurses and indicated practical and on field teaching as the best training method.
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