

Original Research

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Roles, Skills, and Knowledge Requirements of Clinical Pharmacists in Disaster or Emergency Response Teams: A Scoping Review

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Abstract

Objective: The scoping review aims to provide an overview of the existing literature to inform an understanding of pharmacists' roles, skills, and knowledge requirements for Emergency Medical Teams responding to disasters or humanitarian crises.

Methods: The methodology utilized the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR) guidelines, with methodology adapted by the Joanna Briggs Institute. Six databases were searched for sources published after 2000: PubMed, Mednar, Scopus, Defense Technical Information Centre, LILACS, and CINAHL. A manual search of grey literature was conducted to discover additional sources of information outside of the electronic databases.

Results: Of the 427 initial studies and reports, 36 were selected for inclusion. Five key themes on role requirements were identified: supply chain management; establishment and operationalization of pharmacies; stakeholder communication, collaboration, and liaison; direct patient care; and response management and coordination. Each theme was delineated into subthemes linked with requisite skills and knowledge.

Conclusions: This scoping review identifies key roles, skills, and knowledge requirements of pharmacist contributions to Emergency Medical Teams responding to disasters or emergencies.

In the face of natural or man-made disasters, the critical importance of an efficient and well-coordinated World Health Organization Emergency Medical Team (WHO EMT) or other disaster medical team response cannot be overstated. Literature dating from 1966 to current continues to underscore the willingness of pharmacists to actively engage in disaster management, with an explicit acknowledgement of their pivotal roles throughout various phases, including mitigation, preparedness, response, and recovery.^{1–13} As the demand for specialized medical teams intensifies, the WHO EMT Initiative has devised a classification system, delineating EMT responses into Type 1 (mobile team), Type 2 (inpatient surgical and emergency care), and Type 3 (including intensive care) teams, each with unique medical response requirements.^{14–16} The WHO EMT Guide “Classification and minimum standards for emergency medical teams,” known colloquially as the “Blue Book,” defines an EMT as a collective of health care professionals who form an organized and cohesive team formed by governmental entities, charitable/non-governmental organizations (NGOs), military branches, civil protection agencies, international humanitarian networks, United Nations contracted teams, or by the private-for-profit sector.¹⁴

Within the WHO EMT Initiative's comprehensive guidelines, the “Blue” and “Purple” (minimum technical standards and recommendations for reproductive, maternal, newborn, and child health care: EMT) books strongly recommend the inclusion of a pharmacist in Type 3 responses and advocate for pharmacist focal points in Type 2 responses.^{14,15} Despite these recommendations, notable gaps remain in the existing literature concerning the specific roles and requisite skills of pharmacists in EMT Type 2 and 3 responses, and no reference to the inclusion of a pharmacist in an EMT responding to health emergencies in armed conflicts and other insecure environments (the “Red Book”).¹⁶ To address this deficiency and propose evidence-informed roles, skills, and knowledge, a comprehensive review and mapping of available literature on the involvement of pharmacists in an EMT during disaster response is imperative.

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This study aims to elucidate the distinct contributions of pharmacists in EMTs responding to disasters or emergencies, thereby advancing the understanding of the integral role of pharmacists in bolstering emergency medical care during times of crisis.

Objectives

This scoping review aims to provide an overview of the existing literature, identify key themes, and ultimately inform a comprehensive understanding of the roles, skills, and knowledge requirements of pharmacists in EMTs.

Methods

Protocol and Registration

This scoping review utilized the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR) guidelines to systematically identify and map literature on the roles and contributions of pharmacists in an EMT in the acute phase of disaster or emergency response.¹⁷ The scoping review employed PRISMA-ScR for reporting elements, thereby fulfilling the stipulated requirements for a scoping review.¹⁸

Eligibility Criteria and Study Selection

The following inclusion criteria were utilized to screen the studies and reports for abstract review and subsequent extraction:

- Pharmacists and pharmacy students who participated, volunteered, or were employed within EMTs.
 - The EMT is organized by government or NGOs, military or civil protection units or international NGOs (INGOs), United Nations (UN) response teams, or from within the private-for-profit sector.¹⁴
- English language.
- Disaster or emergency response to hazards defined by the United Nations Office for Disaster Risk Reduction International Science Council (UNDRR/ISC) Hazard Definition & Classification Review - Technical Report.¹⁹
- Publications from January 1, 2000 to present. Justification:
 - The United Nations (UN) General Assembly implemented the International Strategy for Disaster Reduction (ISDR) in 2000.
 - Literature from the year 2000 onwards includes the September 11 terrorist attacks, which produced a significant spike in volume of publications related to disasters.

Exclusion criteria

- Research or reports related to pharmacists' roles in other phases of a disaster (prevention, mitigation, preparedness, and recovery)
- Retail (community) and Hospital (clinical) pharmacist roles and skills requirements when working within their usual scope of practice.
- Language other than English
- Sources where full text was not available

Information sources

Information sources considered for this scoping review were primary research studies, systematic reviews, and meta-analyses to capture empirical evidence from professional academic databases. Letters, guidelines, and policy documents were also searched using

Google Scholar and grey literature databases to offer practical recommendations and regulatory perspectives. Job descriptions and job advertisements for pharmacists within government and NGO websites were reviewed for current expectations of role requirements.

A comprehensive search strategy was developed in collaboration with a medical informaticist (TH) and aligned with the PRISMA-ScR guidelines. The initial search was conducted on July 5, 2022, utilizing keywords, Boolean operators, and MeSH terms across multiple electronic databases (PubMed, Mednar, Scopus, Defense Technical Information Centre [DoD DTIC], LILACS, and CINAHL). The research team members (HU, ESW) reviewed the reference lists of relevant studies to discover additional published and unpublished studies that were not initially detected in the scientific databases. The final search results were exported into the Mendeley Ltd reference manager. Once duplicates were removed, the remaining references were uploaded with abstracts into Covidence™ software. Covidence™ is a web-based systematic review management platform utilized to streamline collaboration among the research team by facilitating screening, full-text review, and data extraction and was utilized to identify research articles and grey literature for further screening. Discrepancies over the inclusion or exclusion of documents in the scoping review were resolved through discussion (HU and ESW), and a third member of the research team (DO) was available to arbitrate if a consensus could not be reached.

Search strategy

The following search string of key words were utilized in each database listed above: (“Disaster Medicine” OR “Disaster*” OR “Disaster Planning” OR “Natural Disasters” OR disaster*) AND (“Pharmacy OR Pharmacist*” OR druggist OR “drug service”).

Selection of sources of evidence

Utilizing the Covidence™ software, abstracts of each resource were reviewed by 2 reviewers (HU, ESW) for inclusion criteria and selected for full-text review if the inclusion criteria were satisfied. Articles selected for full-text review were uploaded into the Covidence™ software. Two team members (HU, ESW) independently reviewed each included reference and extracted information on study characteristics into a data extraction template (study design, study participants, type of disaster, location, year, type of EMT) and then emergent themes related to the role requirements of pharmacists, and skills or knowledge requirements of pharmacists (or retrospectively would have been an advantage to have) to perform such roles. Inconsistencies in themes and subthemes extracted from the references were addressed and resolved through dialogue.

Data charting

Two reviewers (HU, ESW) collaboratively designed a data-charting form in the Covidence™ software to ascertain the desired data for extraction to fulfil the scoping review objectives. Subsequently, the reviewers independently charted the data, verbally discussed data extracted to reconcile findings, and iteratively refined the data-charting form throughout the process.

Data items

Qualitative data extracted from the included studies and reports were reviewed and interpreted using inductive reasoning and thematic analysis for patterns of themes related to knowledge and skills to fulfil role requirements in the EMT. The frequencies of study characteristics were examined based on study design (aligning with the Cambridge University Press list of study designs),²⁰ disaster

type (categorized by the UNDRR/ISC Hazard definition and classification review: Technical report),¹⁹ participant involvement (registered pharmacist or pharmacy student, type of emergency medical response team [defined in the WHO EMT “Blue Book¹⁴”]), country of origin of the team, skill, knowledge, and role requirements discussed within the report. Two research team members (HU, ESW) independently identified themes in the skills, knowledge, and role requirements, with verbal consensus resolving discrepancies.

Critical appraisal of individual sources of evidence

Utilizing the literature search and considering the study’s inclusion and exclusion criteria and objectives, 2 research team members (HU, ESW) iteratively developed a framework for qualitative data extraction development and validation, as depicted in the [Supplementary Appendix](#). The extraction framework was designed to capture pertinent themes and subthemes aligning with pharmacists’ roles, skills, and knowledge requirements in an EMT responding to disasters or emergencies. Inconsistencies in the quality of studies and reports were addressed and resolved through dialogue between 2 research team members (HU, ESW).

Synthesis of results

The research team (HU, ESW, DO) determined that the most appropriate method to summarize qualitative data extracted from the included studies and reports was to utilize inductive and semantic reflexive thematic analysis aligning with the methods described by Braun and Clarke.²¹ This interpretative method facilitates identifying and analyzing patterns or themes in pharmacists’ skills, knowledge, and role requirements in EMTs responding to disasters. Two research team members (HU, EW) reached verbal consensus on themes and subthemes identified within the resources, and a third member of the research team (DO) was available to resolve any conflicts or discrepancies. The analytical process utilizes a 6-phase approach with the following steps:²²

- Phase 1: Familiarization with the data, and Phase 2: Generating initial codes. The data extraction sheet outlines the initial identification of the skills, knowledge, and role requirements of pharmacists working within EMTs in disaster response, as described in the narrative of the included articles.
- Phase 3: Generating themes. The data extraction table was then further analyzed to discern potential combinations or consolidation of codes based on shared meanings, facilitating the formation of themes and sub-themes.
- Phase 4: Reviewing potential themes. The research team reviewed all identified themes and subthemes independently and either reached consensus for congruency or iteratively updated the themes and subthemes through discussion.
- Phase 5: Defining and naming themes. Within this phase, the research team matched the skills and knowledge requirement themes and subthemes required to fulfil the role requirements of the research objectives. [Table 2](#) in the supplemental appendix provides the outcomes of the above 5 stages.
- Phase 6: The synthesis of results was reviewed, and a coherent narrative was formulated.

Results

Selection of Sources of Evidence

The initial search of databases and grey literature identified 427 studies. The electronic database searches resulted in 220 studies

(CINAHL, $n = 16$; DoD DTIC, $n = 9$; Mednar, $n = 25$; PubMed, $n = 111$; Scopus, $n = 59$), and after de-duplication, 248 studies progressed to screening. The manual search (and immediate screening for duplication against the database search) of grey literature reports (websites, organizations, books, theses) and citation searches of the database reports retrieved 207 reports. 399 reports were entered into CovidenceTM, and 2 members of the research team (HU, ESW) conducted the first screening of titles and abstracts. After excluding unsuitable records, 107 studies and reports were screened in full text by 2 research team members (HU, EW). Thirty-six studies and reports were determined to fulfil the inclusion criteria of the scoping review (see [Figure 1](#). PRISMA Flowchart).

Characteristics of sources of evidence

The data collection form was created using the CovidenceTM software and is described in [Table 1](#). The included studies and reports described pharmacists within EMTs responding to disasters or emergencies between 2001 and 2022. Of the 36 studies and reports included in the scoping review, 23 were academic peer-reviewed scientific studies, and 13 were reports sourced from non-academic sources or were not considered to fulfil the requirements of a scientific study. The term “sources” will be used throughout this paper to represent the included studies and reports extracted for inclusion in this scoping review. The included sources represented disasters or emergencies in various countries (USA [$n = 23$]; Afghanistan [$n = 4$]; Canada and Pakistan [$n = 3$ each]; Haiti, India, Bahamas, India, Sudan, Africa ($n = 2$ each) and Nepal, Japan, Peru, Saudi Arabia, Malaysia, Sierra Leone, Iraq, Serbia, Lithuania, Bosnia and Herzegovina, Armenia, Sri Lanka, Jordan, Germany, Australia, UK, New Zealand, Brazil, and China ($n = 1$ each). The geographical locations were expressed diagrammatically in [Figure 2](#) utilizing Microsoft Excel®.

The type of hazard requiring disaster or emergency response was categorized according to the Hazards Information Profiles outlined in the UNDRR Report.¹⁹ Of the 36 sources, 7 included biological hazards, 2 discussed environmental hazards, 8 included geohazards, 17 included information on meteorological and hydrological hazards, and 5 discussed societal hazards. Seven sources discussed EMT response in disasters in general without specification of type of hazard. 35 sources contained information on pharmacist participants, and 7 sources included pharmacy students.

Results of individual sources of evidence

Among the 36 sources included in the scoping review, a delineation of 5 principal themes governing the role requirements of pharmacists engaged in EMTs during disaster response was ascertained. Each of these 5 overarching themes underwent additional categorization into subthemes, wherein the requisite skills and knowledge were delineated. The results are represented diagrammatically in [Figure 5](#) in the section “Synthesis of Results.”

Theme 1: Role Requirements – Supply Chain Management

All sources discussed supply chain management as a predominant theme of pharmacist role requirements. The UN describes this supply chain management as “The pharmaceutical value chain” and is conceptualized as a linear progression, as illustrated in [Figure 3](#).⁵⁷ In instances where a source described 1 or more stages in the supply chain, the overarching theme of “supply chain management” was assigned as a Role Requirement theme.

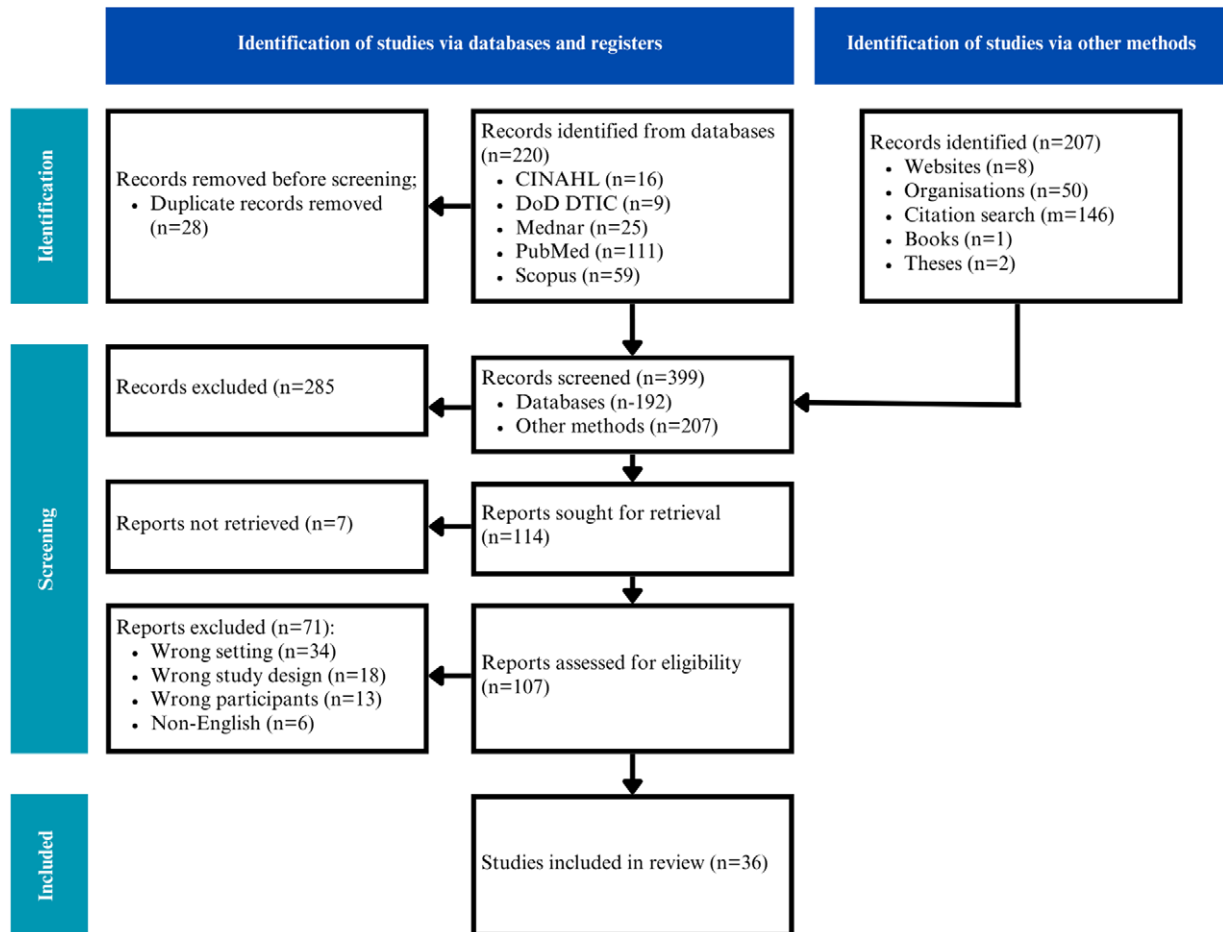


Figure 1. PRISMA Flow Diagram for articles of inclusion in scoping review.¹⁷

Role subtheme 1.1 medicine substitution

Nine sources described medicine substitution as a subtheme of supply chain management.^{30,35,39,41,44,47,50,52} Sources describing this subtheme indicated that as the formulary of medicines cannot be extensive when taken to a disaster site. Substituting “similar medicines” for a patient’s diagnosis indication is required, guided by the pharmacist’s knowledge of appropriate medicine substitution.

Skills theme 1.1.1 knowledge of national and international stockpile inventory

Two sources further described that knowledge of the “national stockpile” of inventory is necessary for a pharmacist to have when making decisions about medicine substitution.^{44,52} The national stockpile can be described as the standardized inventory list of medicines that can be dispatched with EMTs in the event of an emergency or disaster. Knowledge of the national and international stockpile inventory is also a knowledge requirement to fulfil Subtheme 1.2 – Mass dispensing, as the national stockpile inventory will contain a standardized inventory of medicines for treatments.

Skills theme 1.1.2 – medical logistics training

Two sources referenced that medical logistics training was required to fulfil the role of medicine substitution within supply chain management.^{40,47} Medical logistics training can be described as

specific training in accessing the national (or international) stockpile of standardized inventory of medicines. Medical logistics training also describes the knowledge requirement of managing donated stock, which is further described in Subtheme 1.3.

Role subtheme 1.2 mass dispensing

Eight sources described mass dispensing as an additional aspect of supply chain management.^{4,26–28,42,44,52,54} Mass dispensing indicates that fast distribution to a large population is required in the event of mass (or risk of mass) casualties.

Role subtheme 1.3 management of donations

Eight sources described donation management as a subtheme in supply chain management.^{33,38,40,42–43,50,52,56} Donated stock management is not outlined in the traditional stock chain management linear process and requires alternative procurement methods, quality assurance, and reporting rather than accessing national (or international) stockpile medicines.

Role subtheme 1.4 uphold and ensure policy, legal, and financial legislation

Five sources outlined this subtheme as a unique requirement in supply chain management, as the pharmacist’s role in distributing medicines or medical products by an EMT must comply with the national or international legislation at the location of the disaster response.^{25–26,28,50–51}

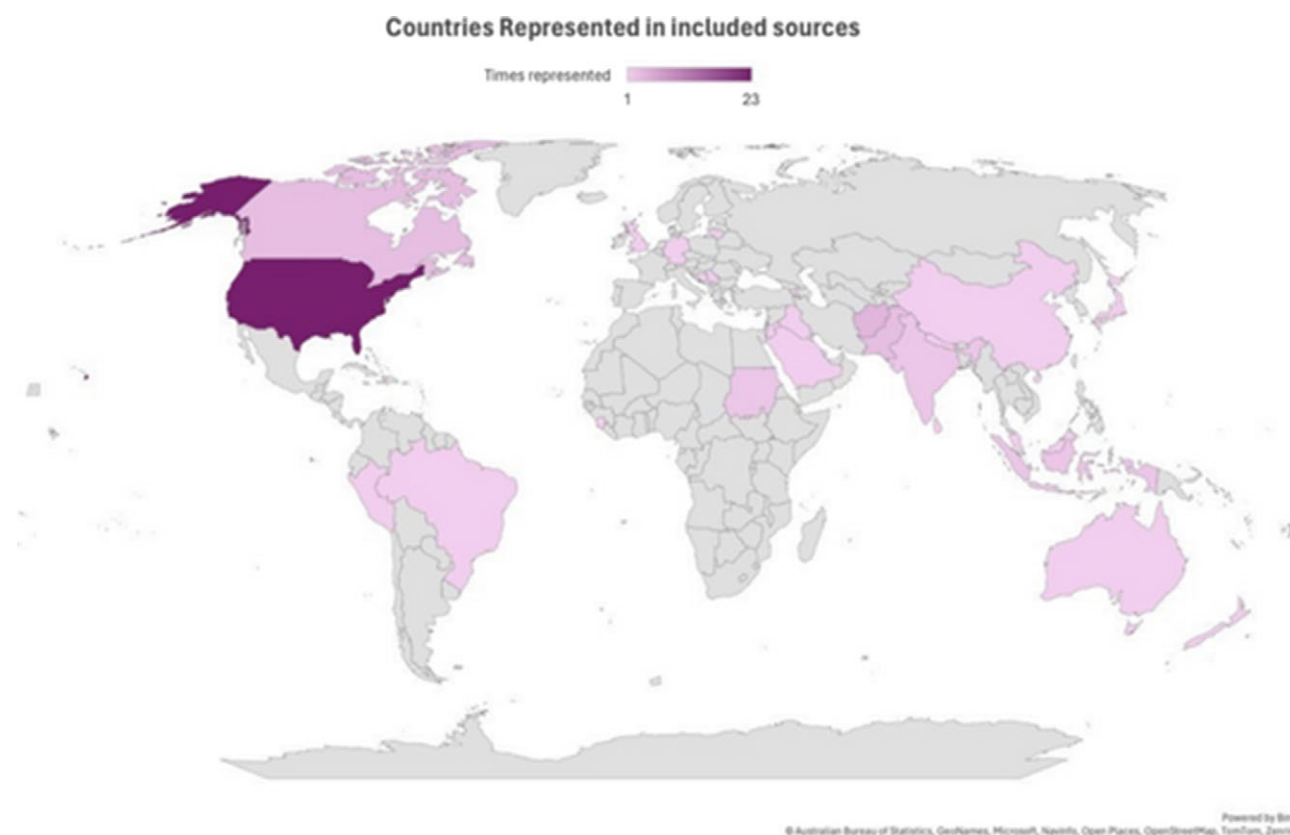


Figure 2. Locations of hazards described in included sources of Scoping Review. Figure 2 was created utilizing Microsoft * Excel.

Skills theme 1.4.1 knowledge of national and international legislation and policies related to pharmacists and medicines

Four sources stated that pharmacists may have differing role authorizations determined by national legislation compared with their organization's country of establishment and must act according to the country of disaster or emergency response.^{26–27,50–51} Medicines, medical records, medical equipment, and consumables may also have different registration and importation legislation.

Role subtheme 1.5 – database management

Eight sources highlighted the requirement of database management to successfully fulfil the role requirement of supply chain management.^{26,41–42,44,49–51,53} Thorough and accurate record keeping is described as essential to fulfil the financial requirements of EMTs and produce reports, such as stock consumption reports and forecasting, and to ensure supply chain sustainability. Database management also includes the need for pharmacists to maintain patient clinical notes in patient medical records. This involves documenting the clinical assessment, management and treatment of patients using medical language that members of the multi-disciplinary team (MDT) can utilize as a communication tool to ensure continuity in patient care.

Skills theme 1.5.1 good use and knowledge of Information Technology (IT) systems

Utilizing electronic software to perform database management is listed as an essential skill in 2 sources.^{26,49}

Role subtheme 1.6 – quality control and assurance

Eight sources stated specifically that a requirement of supply chain management is to ensure that stock is reviewed for quality (within appropriate storage temperature, within the expiration date, visually homogenous), and that the quality will be maintained for the duration of prescribed use of the product.^{13,37–38,42,45,52–53,56} An example provided of quality control is cold-chain management, which is pertinent to ensuring the quality assurance of medicines that may be unstable outside of defined temperature parameters and also assessing the quality of medicines that patients may bring from home.

Theme 2: Role requirements – establishment and operationalization of a pharmacy

Twenty-five sources listed Theme 2 as a core role requirement of pharmacists within an EMT. This theme is described as finding a suitable location for the pharmacy (clean, sustainable electricity, appropriate storage, security, and ability to receive a high flow of patients).^{4,13,26–28,31–40,42,44,47,50–56}

Role subtheme 2.1 - management and leadership of a team

Twelve sources identified that to operationalize a pharmacy location, personnel management is required, including Human Resources (HR) and financial responsibilities, and the responsibility to ensure the team achieves the mission's goals.^{4,13,26–28,32–34,37,40,50–51}

The team may include other pharmacists, pharmacy students, and volunteers.

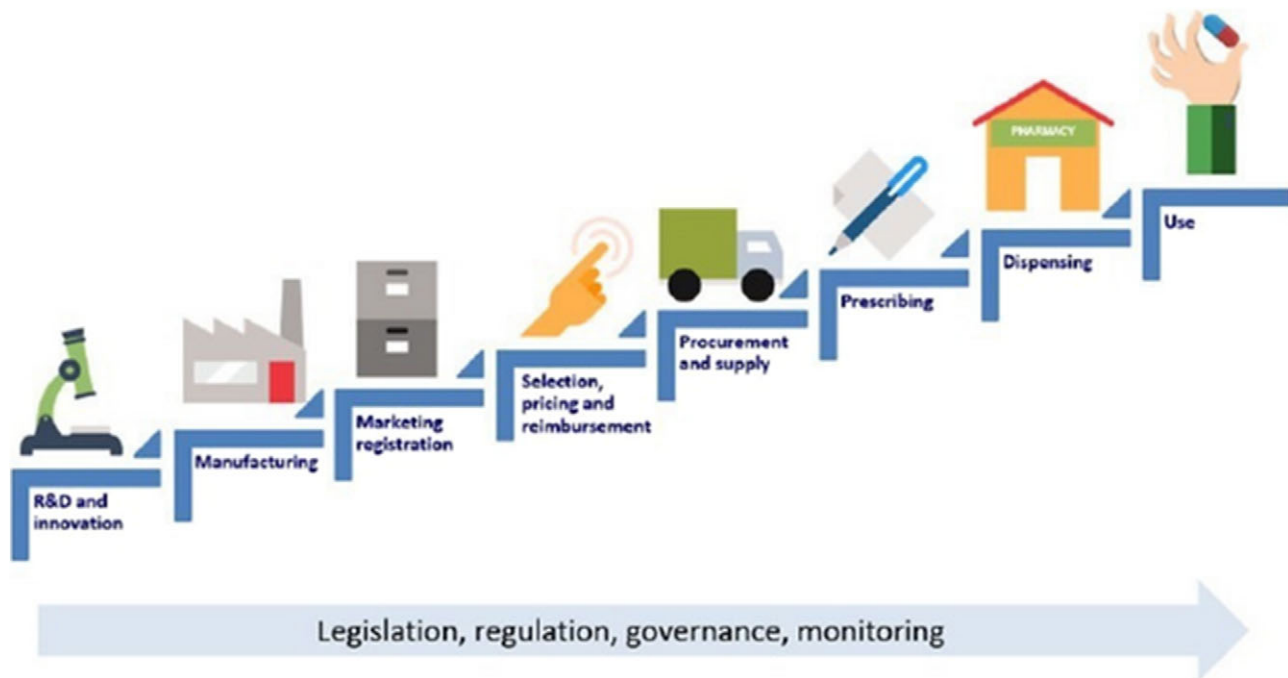


Figure 3. The UN Pharmaceutical Value Chain.⁵⁷

Skills theme 2.1.1 management and leadership skills

Five sources indicated that previous experience in management and leadership, or formalized training in this area, is necessary to fulfil the role responsibility of management and leadership of the team to operationalize a pharmacy within an EMT response.^{26–27,33,40,50}

Role subtheme 2.2 – management of drug destruction

Three sources outlined the responsibility of ensuring that expired medicines, or medicines that are unused at the end of the mission, are appropriately destroyed due to potential exportation legislation, environmental, or safety risks.^{38,40,50}

Theme 3: Role requirements – stakeholder liaison and collaboration

Twenty sources outlined the pharmacist's role in communicating with other members of the MDT or external organizations to contribute to the EMT successfully achieving its goals.^{4,13,25–26,28,32–34,36–37,40–42,44–45,47,49,51–52,56} This theme is further subdivided into 3 subthemes according to the purpose of the communication.

Role subtheme 3.1 – Standard operating procedure (SOP) development and consultation

Fourteen sources discussed the necessity of the pharmacist utilizing pharmacy-specific expertise and training on medicines and legislation to ensure that consistent, transparent, ethical, and legal practices are adhered to by the entire MDT pertaining to medicines and pharmacy professionals within the team.^{4,13,25–26,28,36–37,40–42,44,47,51–52} SOP describes the EMT “rules” of practice, which are also utilized as educational material to train new team members on expected standard practice while operating within the EMT

Role subtheme 3.2 – Liaison with government organizations, NGOs, and private-for-profit organizations

Fourteen sources described the requirement of the EMT pharmacist to communicate on behalf of the EMT with relevant external

agencies, with examples such as communication with utility providers (to ensure electricity and water for the pharmacy location), medical representatives, local pharmacies, customs offices for importation of medicines, the media and local government offices.^{13,25,28,32–33,40,42,44–45,47,49,51–52,56}

Theme 4: Role requirements – direct patient care

Thirty sources discussed the pharmacist's role in interacting directly with the patient in ways other than dispensing medicines within the supply chain management.^{4,13,24–26,28,30,32–34,36–53,55–56} This theme was subdivided into 9 subthemes and highlighted the key clinical knowledge recommended for pharmacists in EMTs.

Role subtheme 4.1 - management and assessment of diseases and health conditions

Twenty-two sources discussed the requirement of pharmacists to clinically assess casualties of emergency or disaster situations independently or collaboratively for pre-existing or new diseases or health conditions.^{4,13,24–28, 34,36,39–42,44,46–48,50,52–53,55–56} The sources discussed that clinical assessment may include screening and triaging casualties for conditions, assessing chronic or acute disease or health condition state management, and then independently or collaboratively managing the condition utilizing pharmaceutical or non-pharmaceutical treatment.

Role subtheme 4.2 – patient counselling and education

Twenty sources stated that a core requirement of a pharmacist in an EMT response is counselling or educating patients on medicine usage, self-screening for symptoms of diseases, management of health conditions, management of potential adverse effects of medicines, and referral pathways for further care.^{25–28,30,32–34,36–37,41–44,48–52,56}

Skills theme 4.1.1 – disaster and emergency medicine training

Seventeen sources specifically described training and experience in the field of disasters and emergencies as unique knowledge necessary to fulfil Subtheme 4.1.^{4,13,27–28,32–33,35–36,42,44,46,48–50,52–53,55}

Considering that disaster and emergency medicine training is a new field of medicine, such knowledge may be lacking from traditional pharmacy education and require addition to fulfil Subtheme 4.1.^{4,13,27–28,32–33,35–36,42,44,46,48–50,52–53,55}

Skills theme 4.1.2 – knowledge of diseases and health conditions

Twenty-seven sources highlighted that to fulfil subtheme 4.1 and 4.2, the pharmacist must have clinical training or experience in the assessment and management of health conditions. This was subdivided into knowledge of 17 key medical fields listed in the following skills subtheme.^{4,13,24–28,30,32,34–37,39–42,44,46–48,50–53,55–56}

Skills subtheme 4.1.1.1 Clinical knowledge and experience in medical fields

Knowledge of 17 unique medical fields was identified in the included literature that pertains to diseases and health conditions: Chemical, biological, radiological and nuclear (CBRN) medicine ($n = 14$), first response training ($n = 12$), public health medicine ($n = 10$), epidemiology ($n = 5$), humanitarian principles ($n = 1$), infectious disease medicine ($n = 12$), administration of vaccinations ($n = 10$), pharmacokinetic and pharmacodynamic expertise ($n = 4$), critical care medicine ($n = 2$), psychiatric medicine ($n = 2$), sexual and reproductive health medicine ($n = 2$), psychological first aid ($n = 2$), dermatology medicine ($n = 1$), wound care management ($n = 1$), respiratory medicine ($n = 1$), laboratory and microbiological science ($n = 1$), and pediatric medicine ($n = 1$).

Role subtheme 4.3 – medicine administration

Medicine administration is not considered dispensing, and therefore is considered a separate role requirement under Theme 1 ($n = 13$).^{25,27,30,33–35,39,41,44,47–48,50,52} Administration involves handing medicine to a patient and observing its intake, rather than the patient independently following the directions provided.

Role subtheme 4.4 – public health promotion

Nine sources described the pharmacist's responsibility to promote public health to casualties of disasters or emergencies (to improve the overall health of the community).^{26–28,37,42,45,50–52} Examples provided included the promotion of clean water, sanitation, and hygiene (WASH), and the use of personal protective equipment (PPE) to avoid disease transmission.

Role subtheme 4.5 – psychosocial support

Five sources stated that pharmacists are well-placed to provide informal psychosocial support to patients, such as reassurance.^{25–26,37,41,52} Psychosocial support is also described as screening patients for psychological distress and referring patients for formal psychosocial management by physicians or psychologists.

Role subtheme 4.6 – prescribing medicines

While the prescription of medicines is included in the supply chain management pathway, this role is traditionally undertaken by physicians or other accredited clinical team members according to local legislation. In a declared state of emergency, legislation may be altered to permit pharmacists to prescribe a defined list of medicines to help ensure that higher acuity patients are screened and prioritized to physicians for treatment prescription. Four sources described this scenario.^{27,45,52,56}

Role subtheme 4.7 – medication reconciliation

Four sources outlined medication reconciliation as a requirement of a pharmacist in an EMT response, which includes taking

patients' medication history and reviewing prescribed medicines to check for congruency, safety, and efficacy according to the patient's medical history.^{4,13,49,52}

Theme 5: Role requirements – response management and coordination (Incident Command System [ICS])

Five sources discussed pharmacists' involvement in the ICS team.^{26,28,32,40,45} The sources describe that the pharmacist may play a formalized role in the standardized international ICS emergency management structure, which is outlined in Figure 4.⁵⁸

Role subtheme 5.1 – situational analysis and risk assessments

Four sources described that pharmacists were required to perform situational analysis and risk assessments for the establishment and operationalization of a pharmacy and for the entire disaster response.^{26,32,40,45}

Skills theme 5.1.1 – disaster and emergency medicine training

As ICS training is not within the traditional pharmacy curriculum, 3 sources discussed that formalized disaster and emergency medicine training is required to fulfil the role requirement of Theme 5.^{26,32,40}

The results of the individual sources of evidence have been collated and expressed in Table 2 within the Supplemental Appendix and in Figure 5.

Limitations

The extracted data may exhibit bias considering the exemption of critical source appraisal in scoping reviews. Unlike systematic reviews, scoping reviews typically do not rigorously assess the quality of included sources, potentially affecting the reliability of the synthesized evidence.⁵⁹ As described in the methods section, a manual search of literature sources across various online search platforms for sources eligible for inclusion was performed. This approach does not constitute an exhaustive survey of all the available literature. The restriction to English-language publications may also introduce bias in the scoping review, particularly given the possibility of a higher occurrence of disasters in non-English-speaking regions, potentially resulting in literature published in non-English languages being missed.⁶⁰

Discussion

This scoping review explored the roles of pharmacists working within EMTs during a disaster or emergency response and linked the roles with requisite skills and knowledge. This review was conducted utilizing the PRISMA-ScR guidelines followed by analysis using the Braun & Clarke methodology.²¹ To date, a literature review on pharmacist roles and skill requirements within an EMT disaster response has not been published. Significant recent research has been conducted on pharmacist capability and potential roles across all stages of the disaster management cycle within the context of community, hospital, and EMTs; this scoping review distinguishes itself by focusing exclusively on the pharmacist roles, knowledge, or skill requisites within the distinct phase of the emergency response only within the context of an organized EMT.^{2,25,52,61,62}

Five key themes related to roles were identified in the included sources, including supply chain management, the establishment and operationalization of a pharmacy, stakeholder liaison and collaboration, direct patient care, and response management and coordination.

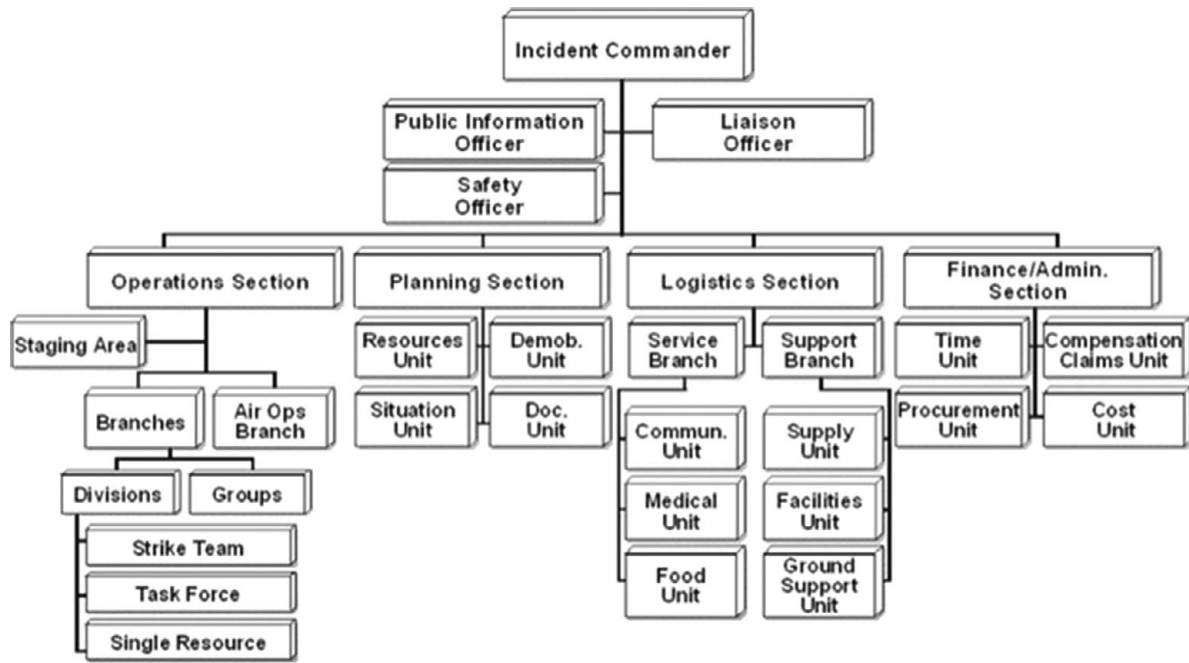


Figure 4. The Federal Emergency Management Agency (FEMA) ICS Structure.⁵⁸

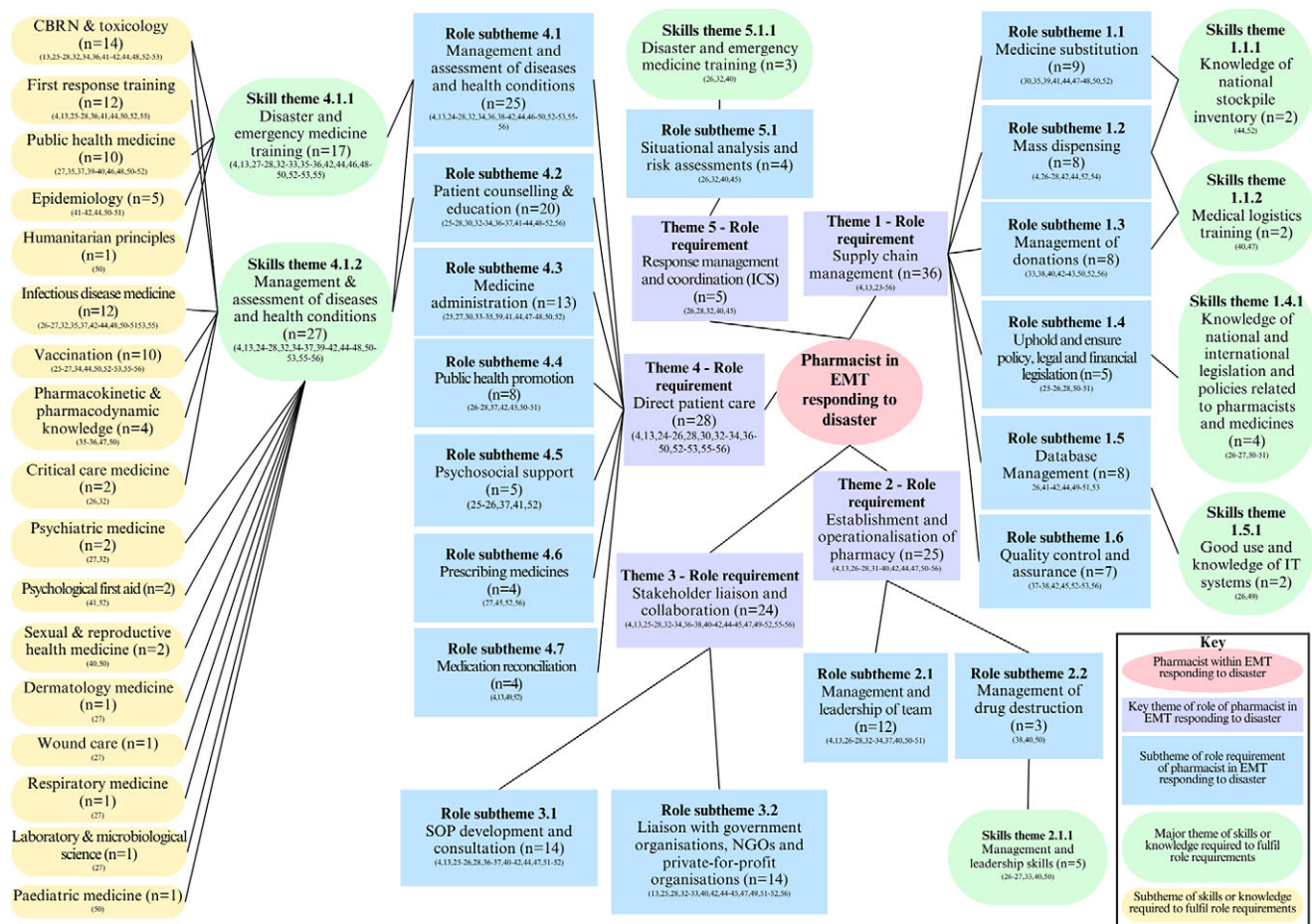


Figure 5. Map of major themes and subthemes of role requirements and requisite skills and knowledge requirements. Figure 5 was created utilizing Canva Pty Ltd.

Theme 1. Supply Chain Management

All included sources underscore this role as a core requirement of pharmacists in managing the supply chain in an EMT response, highlighting a high degree of literature consensus.

Subthemes emerged under the theme of supply chain management, such as medicine substitution (subtheme 1.1), emphasizing the need for pharmacist-guided substitution of medicines during emergencies through knowledge of the standardized inventory list of pharmaceuticals that are deployed in emergency response, often from the national or international stockpile inventory.

The purpose of a national or international stockpile of medicines is for government entities to establish and maintain a strategic reserve of pharmaceuticals and medical supplies. This reserve is intended to serve as a rapid-response repository during emergencies, such as public health crises, facilitating the quick deployment of essential medicines and medical supplies to affected regions, and is often utilized by EMTs to enhance the capacity to manage and control the health impact of emergencies.^{63,64}

International Emergency Health Kits (IEHKs) are pre-packaged medicines and medical equipment standardized by the WHO designed for rapid deployment for international crises. They are aimed to treat 10 000 people for 3 months for immediate health needs during emergencies like natural disasters or conflicts. The inventory of the kits was formulated in 2011 and utilized first during the Libyan conflict, and subsequently used in the Syrian conflict (2012, 2017), the 2013 Philippines typhoon, the 2014 Afghanistan conflict, the 2015 Sierra Leone floods, the 2016 Haitian floods, and the 2018 Yemen conflict.^{65,66}

With a limited and standardized inventory, the inventory kits were originally designed for response to disasters in locations with a high prevalence of communicable diseases and malnutrition. The kits have subsequently been found to be inadequate for populations with a higher prevalence of non-communicable diseases and mental health conditions, as in the Ukrainian-Russian conflict.⁶⁷ Hence, knowledge of medicine substitution is critical when treating population-specific diseases and conditions.

Access to the national or international stockpile also facilitates the potential for mass dispensing of medicines in the event of a mass casualty event that necessitates the safe distribution of medicines to a large population. The need for mass dispensing was highlighted as a specifically critical role of pharmacists in 2001 when the USA experienced a series of anthrax attacks on several media outlets and government offices. These attacks resulted in a significant public health response to contain the incidents through the mass dispensing of prophylactic antibiotics by pharmacists in EMTs.^{34,36,41,44}

When an international response is required, a pharmacist is key to lead the process of supply chain management in terms of the importation of medicines, which requires knowledge of international legislation and policies of the country receiving the response. The scope of practice for pharmacists also exhibits considerable variation internationally, influenced by diverse regulatory frameworks, health care systems, and cultural contexts. Pharmacists' role requirements may differ significantly from country to country, encompassing variations in the extent of clinical involvement, prescribing authority, and engagement in public health initiatives. These divergent scopes of practice underscore the importance of understanding and adhering to the specific legal and professional standards within each jurisdiction, reflecting the nuanced nature of pharmacy practice on a global scale.

Quality control within EMTs refers to the systematic processes and measures implemented to ensure that pharmaceuticals meet

specified standards and comply with international regulations. This includes evaluating pharmaceutical products at various stages, from procurement to importation and distribution, to verify their safety, efficacy, and quality. Quality control measures may involve testing for purity, potency, and stability to guarantee that the pharmaceuticals meet the required standards outlined by international health organizations and regulatory bodies of the country receiving the EMT response. Medicines imported into countries with international responses also require relabelling into the local language to ensure the consumer can safely follow dosing instructions and read information about the medication.⁴² Cold-chain management within EMTs is an example of quality control pertaining to the careful control and monitoring of temperature-sensitive pharmaceutical products throughout the supply chain. Many pharmaceuticals, such as vaccines, are highly sensitive to temperature variations. Cold-chain management applies during storage, transportation, and distribution to ensure the integrity and effectiveness of these products.

All subthemes ascertained under "Theme 1 - Supply chain management" require thorough and accurate record-keeping and reporting to comply with financial and legal requirements and to ensure supply chain sustainability through consumption reports. A pharmacist's aptitude in utilizing electronic software is critical, as utilizing databases and software will produce the most accurate and transparent records for the EMTs, which may be required to report this back to governmental or donor sources. Recent literature reports on pharmacist innovation in electronic software design help ensure the efficiency of these processes.^{68,69}

Theme 2. Establishment and Operationalization of a Pharmacy

Seventy percent of included articles underscored the importance of pharmacists in setting up and operationalizing pharmacies in suitable locations.

The management of drug destruction is a particularly contentious topic currently, as the burden of pharmaceutical waste arising from EMTs constitutes a significant environmental and public health concern within the broader context of health care waste management.⁷⁰ EMTs, by virtue of their swift and often dynamic response to emergencies, generate pharmaceutical waste characterized by expired or unused medications, single-dose vials, and other medical consumables. The potential for contamination of the environment with hazardous substances and the risk of unintended exposures to health care workers or the general public underscores the criticality of implementing effective pharmaceutical waste management strategies within the EMT framework. Balancing the exigencies of timely medical interventions with the imperative of sustainable waste disposal presents a complex challenge that has necessitated the publication of WHO guidelines for the safe disposal of unwanted pharmaceuticals in and after an emergency.⁷⁰ Despite this 1999 guideline, a feature article in *BMJ* reported that after the 2004 Indonesian tsunami, 600 tons of pharmaceuticals had expired or were nearing expiration, costing Indonesia an estimated €2.4 million to dispose of this medicinal waste.^{71,72}

Theme 3. Stakeholder Liaison and Collaboration

This theme emphasizes the pharmacist's integral role in communication within the MDT and with external organizations. In an EMT context, an SOP is a comprehensive document outlining established guidelines, protocols, and systematic steps to be followed by team members during various medical and operational scenarios. SOPs play a crucial role in providing a structured framework for

decision-making and actions, enhancing the consistency of efficiency, effectiveness, and coordination of the team's emergency response. Pharmacists should understand both international and national legislation and policies related to medicines and medical equipment. Integrating pharmacists into the production of SOPs (often in conjunction with logisticians and physicians) will ensure alignment of the EMT with legislation related to all aspects of the pharmaceutical supply chain and pharmacist scope of practice.

Theme 4. Direct Patient Care

Twenty-seven included sources highlighted the role requirement of pharmacists to interact directly with patients (extending beyond supply chain management). Theme 4 could also be described as clinical pharmacy, a specialized pharmacist role (often requiring postgraduate education or experience working within hospitals) in patient care by integrating clinical knowledge with pharmaceutical expertise. Operating within a health care team, the clinical pharmacist collaborates with the MDT and patients to optimize medication therapy for individual patients. Their responsibilities encompass conducting comprehensive medication reviews, assessing treatment plans, and making recommendations to enhance therapeutic outcomes while minimizing adverse effects. Additionally, clinical pharmacists provide direct patient care by offering education on medication regimens, addressing patient concerns, and participating in disease management initiatives. Pharmacists may independently manage lower acuity conditions or pre-existing conditions to allow physicians the time and space to clinically manage higher acuity patients, which may predominate in mass casualty incidents.

The most cited knowledge requirement in this subtheme is CBRN. CBRN knowledge encompasses an understanding of the effects of CBRN agents on human health in order to screen and triage patients, knowledge of the appropriate use of prophylaxis and treatments, and the management of pharmaceuticals in such scenarios. Despite the 1925 Geneva Protocol prohibiting the use of chemical and biological weapons in conflict/war scenarios, instances of CBRN substances being intentionally used over the last century have been documented.⁷³ One of the most notable incidents occurred during the Syrian Civil War, specifically from 2013 onwards, where chemical weapons, particularly sarin gas, were deployed, resulting in civilian casualties and international condemnation.⁷⁴ While the use of biological weapons has been less frequent, notable occurrences include when the USA experienced a series of anthrax attacks in 2001.^{36,41} While officially unconfirmed, there have also been several news reports of chemical weapons, such as chloropicrin, being used in the 2022-to-present Russian-Ukrainian conflict.⁷⁵⁻⁷⁶ There are also ongoing concerns about the attack on the nuclear power plant in Zaporizhzhia, which could have similar outcomes to the Chernobyl disaster of 1986.⁷⁷ Considering the suggested positive impact of pharmacists responding to the 2001 anthrax attack in the USA and the potential pharmaceutical requirement for prophylaxis or treatment of CBRN attacks in Ukraine, the involvement of a pharmacist to support EMTs in conflict or unstable environments is recommended.^{32,34,44} This suggestion would encompass the addition of a pharmacist to the WHO guidance document, "Red Book," for medical teams responding to health emergencies in armed conflicts and other insecure environments.¹⁶

As suggested in Subtheme 4.1.2, knowledge of infectious diseases has been of value to significant EMT responses. Meteorological and hydrological hazards such as floods and storms have been shown to significantly increase the incidence of infections, specifically bacterial (such as leptospirosis), viral (such as dengue

fever), and fungal (such as aspergillus).⁷⁸⁻⁸³ Judicious use of antimicrobials is necessary not only to treat infections but also to reduce the impact on antimicrobial resistance.⁸² Of particular concern is infections of combat-related injuries, with a high incidence of multi-resistant Gram negative infections resulting in significant morbidity, unnecessary amputations and, therefore, disability for individuals. Elevated rates of disability stemming from combat-related injuries impose substantial additional burdens on nations already contending with challenges related to conflict-induced infrastructure destruction, financial constraints, and the management of internally displaced persons.⁷⁸⁻⁸³ A pharmacist's knowledge of the appropriate treatment of diagnosed infections and antimicrobial stewardship is particularly advantageous both in natural and societal disasters.

Theme 5. Response Management and Coordination

Finally, Theme 5 explores the pharmacist's potential role in the ICS, involving situational analysis and risk assessments (subtheme 5.1), underpinned by knowledge of disaster and emergency management training (5.1.1).

A disaster is marked by physical damage, debris, and obstacles, often involving unstable structures, power outages, and communication breakdowns. Limited resources, both of supplies and personnel, intensify the need for coordinated and prompt response efforts to address immediate threats and provide essential services afterwards. Operationalizing a pharmacy and managing a team of junior staff and volunteers (Subtheme 2.1) in such environments requires that a pharmacist cohesively interacts with or communicates with the ICS. The ICS provides a scalable structure with clearly defined roles, responsibilities, and communication protocols and ensures effective collaboration among various agencies and personnel during incidents, facilitating a coordinated and organized approach to emergency management.⁵⁸ The ICS structure is not traditionally taught in the pharmacist tertiary curriculum and must be learned through experience or formal post-graduate training in disaster medicine. While ICS training has been recommended previously for pharmacy education, a review of available literature suggests this rarely occurs.⁸⁴⁻⁸⁶

Implications of the Findings for Practice, Policy, and Future Research

A comprehensive investigation, such as a systematic review, is recommended to elucidate the multifaceted role of a pharmacist in EMT responses to disasters or emergencies. This rigorous examination will serve to meticulously assess existing literature, offering a synthesized perspective on pharmacists' contributions. Subsequently, to validate and refine these findings, a Delphi study is recommended, utilizing expert consensus to enhance the robustness of the evidence. The outcomes of this combined research endeavor hold the potential for informing the development and expansion of international guidelines such as EMT Initiative guidelines - the "Blue," "Purple," and "Red" Books.

Conclusion

This scoping review elucidates the essential role of pharmacists, leveraging their unique skill set, in augmenting the operational efficiency of EMTs during disaster responses. Critical knowledge domains identified for pharmacists in this specialized context encompass supply chain management, establishment and operationalization

of pharmacies, stakeholder communication, collaboration and liaison, direct patient care, and response management and coordination. Each overarching theme unfolds into distinct subthemes delineating role-specific requirements intrinsically linked with requisite skills and knowledge. This review proposes the utilization of its findings for further extensive research, such as a systematic review and a Delphi study for the potential optimization of international guidelines established by bodies like the WHO EMT Initiative.

Supplementary material. To view supplementary material for this article, please visit <http://doi.org/10.1017/dmp.2024.280>.

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