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**Section Editors: Leanne Tyler, Heather McLellan**

# Flipping the virtual classroom: A novel approach to critical care education in undergraduate nursing

**Thomas Lau**

## The Problem

Case studies had been adopted as an active learning strategy in delivery of critical care nursing content at an undergraduate level. In the setting of a flipped classroom, students completed assigned readings independently prior to leading case discussions in weekly face-to-face seminars. Owing to the unexpected COVID-19 lockdown in March 2020, this model was rapidly transitioned to an asynchronous online forum where real-time interactions and instructions were not possible. In keeping with the goals of active self-directed learning, an alternative method of knowledge translation was needed to disseminate complex critical care concepts to pre-registration nurses.

## The Solution

Prior to the pandemic, the Canadian Alliance of Nursing Educators Using Simulation (CAN-Sim) and the Emergency Nurses Association (ENA) made use of the Shareable Content Object Reference Model (SCORM) to create post-graduate-level virtual simulations and interactive e-courses. SCORM is a useful eLearning instrument characterized by engaging learner-centric features such as multimedia contents and graded interactivities. Based on favourable anecdotal experiences of these resources, a SCORM on upper gastrointestinal bleed management was developed with PowerPoint and trialled with 15 undergraduate learners. Using the SCORM, learners acquired knowledge through a series of textual information and adaptive interactivities. Case knowledge was then confirmed and assessed in an asynchronous online plenary.

## The Evaluation

In creating this learning package, care was taken to maximize its reach across a diversity of learning styles in the virtual space. PowerPoint emerged as the most appropriate authoring tool, due to its ease of use and adaptivity to a Learning Management System (LMS) that was not optimized for SCORM. Built around a set of predetermined discussion questions and learning objectives, knowledge was transferred through a series of carefully curated texts and a variety of interactivities, such as sequencing, true or false, branching, and graphics labelling. Where direct instruction is needed, Socratic questions and mini quizzes were used to promote introspection and critical thinking. Through interactivities, learners reported a high level of understanding of pharmacology and pathophysiological concepts in the setting of an upper GI bleed.

The use of PowerPoint as the primary authoring tool presented several key challenges. Owing to its limitations as a tool designed for traditional presentations, most activities and information was delivered textually on screen. While favourable to visual and read/write learners, the absence of a live presenter and narration represented a challenge for aural and tactile learners. PowerPoint was also unable to showcase the full range of features of SCORM created by dedicated professional authoring tools. Activities such as drag and drop, Likert scales and short answers were not possible in the PowerPoint runtime environment. Most importantly, an assessment framework was absent. Key metrics such as time spent on module and scoring was unable to be reviewed

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and collected. Lastly, development of a SCORM in the absence of a professional authoring tool proved to be resource and time intensive, as it required a considerable technical proficiency with PowerPoint.

## Sustainability

Due to low levels of adoption of eLearning prior to the pandemic, technologies like SCORM were seldomly deployed in undergraduate nursing education. In envisioning the future of nursing education, SCORM represents a powerful alternative to traditional passive eLearning instruments, such as online discussion boards and pre-recorded lectures. Successful and sustainable implementation of SCORM, however, requires thoughtful realignment of course content to meet the goals of active self-directed learning in an increasingly virtual learning environment. A concerted effort to optimize of LMS to SCROM on the part of the learning institution is also required. Lastly, a degree of technical competency in all parties involved is necessary in a successful deployment of SCORM in nursing education.

## About the Author

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# The impact of nurse practitioner role in emergency departments: A protocol for a mixed studies systematic review

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## Abstract

**Background:** Overcrowding and long wait times in the emergency department (ED) have resulted in decreased patient satisfaction and quality of care. One of the solutions proposed to address wait times is the introduction of the nurse practitioner (NP) role in the ED. We present a systematic mixed studies review protocol that aims to gather and analyze available knowledge on the impact of the NP role in the ED on patients, other healthcare providers, and organizations.

**Methods:** The review will employ a mixed studies analysis approach. Data will be gathered from peer-reviewed and grey literature in English with no time limit. All international publications on the impact of NP role implementation that meet the inclusion criteria in the ED setting will be included. Each study will be appraised for quality using the mixed methods appraisal tool and data extracted by two independent authors. In the presence of conflict, a third author will provide a resolution. Study characteristics and findings will be synthesized using descriptive analysis, meta-analysis, and a three-stage thematic analysis approach. The review results will be presented using the PRISMA checklist for systematic reviews.

**Conclusions:** The systematic review will present current evidence on the impact of the NP role implementation in the ED setting. The results are anticipated to support decisions and policymakers in their quest to decrease ED wait times and improve the quality of patient care in healthcare settings.

*Keywords:* nursing, nurse practitioner, emergency department, patient care, systematic review

Emergency departments (EDs) are increasingly caring for patients presenting with non-life-threatening conditions. The ED is open around the clock, with highly qualified healthcare providers available to care for any patient who reaches its doors (Tucker & Bernard, 2015). Hospitals have an obligation to provide medically necessary care in a publicly funded service; staff in the ED have a duty to provide any medically necessary healthcare support when an individual accesses the ED, regardless of their acuity (Health Canada, 2023). Persistent shortages of primary care practitioners and limited access to after-hours primary care services are driving an increase in patients accessing ED for care (Keough et al., 2016). In addition, limited accessibility to inpatient beds, aging populations, and service delivery factors (e.g., delay in discharge orinvestigations) have resulted in ED overcrowding and long wait times (Carter et al., 2014; Pearce et al., 2023). Because the ED's primary goal is to support complex patients with complex illness, prolonged wait times and decreased patient flow affects hospital staff morale, job satisfaction, and

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patient quality of care (Hammer et al., 2022; Petrie & Comber, 2020). Overcrowding in the ED overwhelms resources and has been associated with higher mortality rates, patients leaving without being seen, long wait times, and low patient satisfaction (Bernstein et al., 2009; Javidan et al., 2021). The risk and impact of ED overcrowding and increased wait times have recently been reported in the media and literature (Bennett, 2022; Geary, 2017).

To decrease the risk to patients and increase the quality of care, hospital administrators and ED leaders are introducing nurse practitioners (NPs) in the ED to address overcrowding (Van der Linden et al., 2019). An ED nurse practitioner can help meet the care needs of patients with non-emergent presentations (Middleton et al., 2019). NPs are registered nurses with advanced nursing graduate education and experience, which enables them to practice independently (Canadian Nurses Association, 2016). They perform comprehensive assessments, diagnose health conditions, and treat illnesses using a holistic care model. NPs can order and interpret diagnostic tests, prescribe medications, and perform medical procedures within their scope of practice (Canadian Nurses Association, 2010). The addition of an NP in the ED can decrease the length of stay, reduce the number of patients who leave the ED without being seen, increase the number of patients being cared for, and improve patient satisfaction (Shand et al., 2020; Tucker & Bernard, 2015). This protocol aims to describe the components of a mixed studies review intended to integrate current evidence of the impact of the NP role in the ED on patient outcomes.

## Background

Even though there are recent publications on the impact of the NP role in the ED, a search of the Cochrane Library and International Prospective Register of Systematic Reviews (PROSPERO) confirmed there are no similar reviews underway. The most recent related systematic review focused on cost, quality of care, satisfaction, and wait times (Jennings et al., 2015). No recent systematic reviews have examined the overall NP role impact on patient, provider, and organizational outcomes. This review will address the gap and provide aggregate data to advance knowledge in this area to inform health care policy decisions.

## Method

This systematic review will be guided by the Cochrane Handbook and reported according to preferred reporting items for systematic reviews and meta-analysis (PRISMA) updated guidelines (Page et al., 2021). This protocol has been developed using the preferred reporting items for systematic reviews and meta-analysis protocol (PRISMA-P) statement checklist (Moher et al., 2015). The protocol has been registered with the PROSPERO (CRD42022330419).

### Research question

The primary objective of the review is to identify and analyze data on the impact of the NP's role on patients receiving care in EDs compared to alternative interventions. Secondary objectives include collecting data from research databases and grey literature on the effect of the NP role on other healthcare providers (HCPs), patient families and caregivers, and healthcare organizations. Evidence on the overall impact of the NP role will be relevant for diverse healthcare decision-makers (administrators, leadership, and policymakers). The objectives are appropriate to the setting, meaningful to decision-makers, and purposeful in addressing the knowledge gap (Thabane et al., 2009). The population, intervention, comparison or context, outcome, and study design (PICOS) framework was used to develop the research question (Thomas et al., 2021; Table 1): What is the impact of the ED NP role on patient outcomes?

### Study eligibility criteria

*Inclusion and exclusion criteria*

The systematic review will include data from EDs that support all patient populations. The review will focus on studies evaluating the impact of the NP role in EDs. The review will include studies reporting on patient-related outcomes (e.g., wait-time, satisfaction), other professional healthcare providers (e.g., reported satisfaction, experience), and organizations (e.g., ED performance measures) associated with the NP role in ED settings. All relevant peer-reviewed articles available in searched databases and additional studies from specific grey literature sources will be included without any time or geographic limitation (Meline, 2006). Any study articles that meet the inclusion criteria from the inception of the databases to the present will be included in the analysis. Quantitative, qualitative, and mixed-methods studies that meet the inclusion criteria will be retrieved, and the results analyzed for this review. The search will be limited to studies with titles and abstracts published in English. An eligibility screening form will support the selection of articles (see Additional File 1).

*Search strategy*

The following databases will be searched from inception to present using combination keywords and subject headings: CINAHL (EBSCO), MEDLINE (OVID), EMBASE (OVID), SCOPUS (Elsevier), Cochrane Library (Wiley). These databases were chosen for their ability to identify comprehensive health-related studies. The search terms will comprise "nurse

**Table 1**

*Research Question Components*

| | |
|---|---|
| Population | All patients presenting to the ED |
| Intervention | NP practising in the ED |
| Comparisons | Standard of care, EDs with no NPs, care provided by other Health Care Providers |
| Outcomes | Primary Outcomes:<br>• Patient-reported outcome measures<br>• Patient-reported experience measures<br><br>Secondary Outcomes:<br>• Healthcare provider experience measures<br>• Health system performance measures<br>• Emergency department performance measures |
| Study design | Research studies that utilize randomized controlled trials, non-randomized controlled trials, observational studies, cross-sectional studies, qualitative studies, and mixed methods studies |

practitioner," "advanced practice nurs*," "nurse clinician," "nurse consultant," "emergency department," "emergency room," "emergency unit,*" "trauma cent,*" and "urgent care." Truncation, subject headings, and combination terms using and/or will be employed to support the search terms and aid in the retrieval of all relevant available published articles in the databases.

Additional studies will be sought using expanded grey literature search methods. The inclusion of grey literature will ensure that all unpublished relevant study results will be captured in the analysis and reported in the review results (Hilbrecht et al., n.d.). Grey literature sources will include ProQuest Dissertation and Theses Global; World Health Organization (WHO) International Clinical Trials Registry Platform (ICTRP) and clinicaltrials.gov for ongoing trials. Citation chaining using SCOPUS to review reference lists and citations by documents of relevant studies suggested by PubMed and SCOPUS will be reviewed. Study authors will be contacted for additional information if needed (Mahood et al., 2014). The search strategy and results will be presented using the PRISMA flow diagram (Page et al., 2021). The sample search from MEDLINE is included in Table 2.

**Data management**

All included study articles, extant, and included grey literature will be uploaded into Mendeley to allow for convenient referencing and creation of the final bibliography for the systematic review reporting. Covidence (Veritas Health Innovation, Melbourne, Australia) will be used to support data management including the elimination of duplicates, title, and abstract screening, as well as full-text screening (Kellermeyer et al., 2018). The Covidence online data management software is free and widely available. All team members can have access to the platform to support or to track the reviewed articles and management of data. All articles retrieved from databases as per the search strategy will be uploaded from Mendeley into the Covidence data management software. Additional studies obtained through grey literature sources will be stored in a Google file during the data extraction process.

All retrieved full-text articles will be assessed independently for risk of bias by two reviewers. In the presence of conflicts, a consensus will be attempted and, if not reached, a third reviewer will be contacted to resolve any discrepancies (Boutron et al., 2022). The Mixed Methods Appraisal Tool (MMAT) will be applied to assess the quality of all included studies (Hong et al., 2018). The MMAT is a validated tool used to critically appraise all study types: quantitative, qualitative, and mixed methods. The tool requires evaluators to respond to two initial questions to determine if the tool is appropriate for evaluating the risk of bias. Within each of the categories, there are five questions to support the evaluation of each study for risk of bias. Quality assessment results from the MMAT will not be used to exclude studies from the analysis phase (Tricco et al., 2011). All articles that meet the inclusion criteria will be analyzed and data reported to show the breadth of evidence in the literature. The outcome of the quality assessment will be presented to provide comprehensive information about included studies (Tricco et al., 2011).

**Data extraction**

Data will be captured from all included studies using a customized data extraction form developed in Microsoft Excel. The following information will be extracted from each study.

*Study characteristics*

Author, publication year, country, trial registration number, funding source, setting (size, rural/urban), objective(s), research question(s), design, analysis method, recruitment process, sample, outcome measures, key findings (primary and secondary), reported limitations, author conclusions, and reviewer notes.

*Population*

Sample size, professional designation, intervention group, control group, age, gender, and triage level.

*Intervention and comparators*

Intervention name and type (i.e., NP role type), demographic data, the phenomenon of study, intervention descriptors, method of data collection, and timing of data collection (pre- and post-intervention).

For studies reporting quantitative results, additional statistical data including mean, median, standard deviations, and significance reported, will be captured. Data on coding and themes, as reported by qualitative studies, will also be captured in the extraction form. The extraction form contains elements necessary to capture findings from all included studies irrespective of

**Table 2**

*Database (MEDLINE) Search Strategy*

| Search | Term | Results |
|---|---|---|
| S1 | nurse practitioners/ or nurse clinicians | 25,726 |
| S2 | Advanced Practice Nursing/ | 1,980 |
| S3 | ("nurse practitioner*" or "advanced practice nurs*" or "nurse clinician" or "nurse consultant*").mp | 35,233 |
| S4 | S1 or S2 or S3 | 35,233 |
| S5 | exp Emergency Service, Hospital/ | 93,539 |
| S6 | ("emergency department*" or "emergency room*" or "emergency unit*" or "trauma cent*" or "urgent care").mp | 158,524 |
| S7 | emergency medical services/ or triage/ | 58,592 |
| S8 | triag*.mp | 30,705 |
| S9 | S5 or S6 or S7 or S8 | 241,245 |
| S10 | S4 and S9 | 1,743 |
| S11 | ("home* health*" or "home*care" or "nursing home*" or "long term care" or "longterm care").ti. | 41,617 |
| S12 | S10 not S11 | 1,710 |
| S13 | limit S12 to (case reports or comment or editorial or letter) | 166 |
| S14 | S12 not S13 | 1,544 |
| S15 | limit S14 to English language | 1,523 |

the methodology (i.e., quantitative, qualitative, and mixed methods). These extracted data will inform the analysis necessary to address the systematic review question.

The data extraction form (see Additional File 2 for elements) will be piloted on 5 to 10 % of the included study sample to ensure all reviewers involved in the extraction process are capturing information in a similar way (Systematic reviews, n.d.). The feedback information gathered during the pilot phase will be used to update the form prior to data extraction of the remaining study articles. Two authors will independently extract data from each included study. Data extraction forms will be compared once both authors have completed the extraction process to confirm the agreement and identify any discrepancies. Discrepancies will be resolved using a discussion and consensus approach (Li et al., 2022). If a discussion between the two authors does not resolve the difference, a third author will review the extraction data as well as the study report in question and confirm which data to include.

**Data synthesis**

The study and participant characteristics, as well as contextual factors extracted from the studies, will be presented in a descriptive format. Quantitative study outcomes will be synthesized if homogeneity is present among the data (Deeks et al., 2022). A subgroup analysis will be performed to investigate the heterogeneity of the quantitative data (Campbell et al., 2020). Similar study outcomes, including wait times and the number of patients who left without treatment, will be grouped to ensure appropriate comparison (McKenzie & Brennan, 2022). Extracted data, including sample size and reported findings for intervention and comparator, will be uploaded into ReviewManager (RevMan 5) for analysis (Higgins et al., 2022). The results of the meta-analysis will be presented in tables, charts, and forest plots demonstrating the confidence interval, relevant risk, weight, significance, and p-values reported by the RevMan 5 software (Higgins et al., 2022). Any reported quantitative data that are not suitable for meta-analysis will go through a vote counting based on the direction of the intervention effect. Studies with the most votes will be prioritized in the reporting of findings (Campbell et al., 2020; McKenzie & Brennan, 2022).

Extracted qualitative data will be analyzed using a three-stage thematic analysis approach as outlined by Thomas and Harden (2008). The coding stage will involve line-by-line coding by the authors and recording of the findings from each study to be examined for meaning. At the descriptive stage, the primary author will reorganize the themes into related categories. Each category will be examined for meaning, and any relevant properties captured. In the final analytical stage, the research team will compare categories to discover similarities. Similar categories will be grouped into themes using a higher-order abstraction of the underlying phenomenon (Butler et al., 2016; Thomas & Harden, 2008). Extracted data from mixed methods studies will be analyzed as part of the meta-analysis (if suitable) and the thematic analysis as appropriate. Otherwise, a descriptive analysis will be used to synthesize the study outcomes. The descriptive analysis will include grouping of similar themes into categories and describing the findings in a summary table. A data analysis results summary including the findings, quality, strength, relevance, applicability, and limitations of the studies and synthesis methods, will be presented in the discussion and implication for practice sections (Campbell et al., 2020).

## Strengths and Limitations

The review has many methodological strengths. It will be guided by the Cochrane Handbook and reported according to the PRISMA guideline (Page et al., 2021). The review will include peer-reviewed, as well as grey literature from broad sources to capture all available data for analysis. The review will include many study types to support a rich knowledge generation. Quality assessments will be completed on all included studies and data analyzed using both descriptive and thematic approaches. Even though the review includes literature from a variety of sources, it would be limited to information published in the English language only. There may be studies or documents published in the grey literature in languages other than English that would not be included and, hence, factored into results and implications. In addition, only five databases will be included in the peer-reviewed search. There is a potential to miss studies if not published in the chosen databases. Finally, the broad scope of the review could require a high level of resources to support the quality assessment, data extraction, and data analysis.

## Summary

The systematic review aims to gather and analyze the current evidence on the impact of the NP role in ED settings. The work of NPs in the ED has been reported to positively affect wait times and reduce overcrowding. Even though there is evidence to support the NP role in the ED setting, there has not been a recent review to aggregate these important findings. This protocol outlines the steps to be undertaken in a mixed studies systematic review that will retrieve and synthesize available international evidence to advance knowledge and support policy decisions on the NP role in the ED, its impact on patient outcomes, effects on other healthcare providers, and benefits to health care organizations.

## Implications for emergency clinical practice

1. The review will provide new knowledge on the impact of the NP role in emergency departments. It can advance the current knowledge on how introducing an NP in the ED setting can support factors that, ultimately, lead to quality patient care, such as decreased wait times, increased flow, increased patient satisfaction, and decreased patient morbidity and mortality.
2. The review will provide an aggregate of the available data on the perspectives (positive and negative) of patients and other healthcare providers working with NPs in the ED setting.
3. Leaders, professional associations, and policymakers within the ED setting can use the results to guide future decisions about when, how, and why to utilize an NP in such settings.

## About the authors

*Sarah A. Lartey, RN, BScN, MN, is a registered nurse working as a nurse manager and completing her PhD in Nursing at the University of Alberta. Her research focus is on nursing leadership and healthcare policy. Her research explores nursing leadership*

*roles, including NPs, charge nurses, and managers, and examines how they and health policy impact patients, organizations, and communities.*

*Carmel L. Montgomery, RN, PhD, is an assistant professor in the Faculty of Nursing at the University of Alberta. Her program of research is focused on outcomes of critical illness in patients living with frailty as well as the impact of advanced practice nursing roles in the health care system.*


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## Contributions of the authorship team & CRedIT author statement

***Sarah A. Lartey:*** *Main author.* ***Matthew J. Douma:*** *Contributor.* ***Megan Kennedy:*** *Database search and strategy development.* ***Greta Cummings:*** *Collaborator.* ***Charlotte Pooler:*** *Collaborator.* ***Carmel L. Montgomery:*** *Main contributor, guarantor, and supervision.*

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**Additional File 1**

**Eligibility Form**

**NURSE PRACTITIONER IMPACT IN EMERGENCY DEPARTMENT**

| | |
|---|---|
| Date | |
| Assessor Name | |
| Study Author(s) & Publication Year | |
| Title | |
| Source (Journal, etc.) | |
| Eligibility Assessment | |
| Study Design | |
| Research Study? | Yes _____ No_____ |
| Type of Study | Randomized control study<br>Non-randomized control study<br>Observational study<br>Cross-sectional study<br>Qualitative study<br>Mixed-methods study<br>Unclear |
| Participants | |
| Patients | Yes _____ No _____ Unclear _____ |
| Healthcare Providers | Yes _____ No _____ Unclear _____ |
| Setting | |
| Emergency Department | Yes _____ No _____ Unclear _____ |
| Nurse Practitioner Role Impact | |
| NP/ENP/FNP/ANP* | Yes _____ No _____ Unclear _____ |
| Outcome Measured | Patient _____<br>Family/caregiver _____<br>Healthcare Provider _____<br>Organizational _____ |
| Decision | |
| Include | |
| Exclude | Reason: _____ |
| Unsure | Follow Up Completed: _____ |

*NP – Nurse Practitioner, ENP – Emergency Nurse Practitioner, FNP – Family Nurse Practitioner, ANP – Advanced Nurse Practitioner

**Additional File 2**

**Data Extraction Form**

Data extraction form fields:

1. Extractor Name
2. Extraction Date
3. General information (Author, publication year, country, theoretical framework)
4. Study Characteristics (objective, research question, design, recruitment procedure)
5. Participant's Characteristics (age, gender, profession, sample size)
6. ED characteristics (size, patient population, location)
7. Intervention and comparator characteristics (NP role type, demographic data, control group, phenomenon of study)
8. Primary findings and outcomes (patient-related)
9. Secondary findings and outcomes (HCPs, organization, setting related)
10. Reported study conclusions
11. Miscellaneous (reported limitations) / Reviewer notes

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# Exploring delay points at the emergency department

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## Abstract

**Background:** The increasing time spent in the emergency department is becoming a global problem contributing to overcrowding. The increased length of stay in the emergency department can negatively affect patients' perception of care, contributes to high morbidity and mortality rates, and increased aggression towards staff. Therefore, understanding the delay points will help administrators and policy makers channel resources to the areas that require improvement.

**Methods:** This quality improvement project uses a cross-sectional descriptive study to evaluate the delay points in the emergency department. The study was conducted at a level IV community hospital in British Columbia. One hundred sixty-seven participants were recruited using a consecutive convenience sampling.

**Results:** The age of the respondents ranged from 18–101 years. There were more females (*n* = 85, 50.9%) than males (*n* = 80, 47.9%). The care point with the longest wait time was diagnostic and laboratory testing to physician reassessment (median time 65 minutes), followed by initial physician assessment to imaging (median time 52 minutes) and, finally, nurse-to-physician assessment (median time 45 minutes). Despite the prolonged length of stay in the emergency department, most participants rated the experience at the emergency visit favourably (70, 42%) and 49.1% were satisfied with the care provided by the staff, while 59.9% indicated that they would recommend this emergency department to others.

**Conclusion:** Diagnostic and turnaround time and waiting for physician reassessments are important points in the patient journey in the emergency department that can prolong length of stay. Future studies are needed to determine whether various interventions such as point-of-care testing, utilizing the Lean Model, and improving physician services can help reduce lengths of stay in the emergency department.

*Keywords:* Emergency department, length of stay, points of delay, patient experience.

## Background

Overcrowding and long wait times in the emergency department (ED) are increasingly becoming a global concern, and some countries have considered the situation to constitute a national crisis (Eitel et al., 2010). Furthermore, ED overcrowding occurs when ED arrival rate (input) exceeds ED discharge and transfer rates (output), leading to an increase in the healthcare demand. This increased demand can result in periods when demand for care exceeds supply of available care providers, resulting in extended wait times for treatment initiation, ED length of stay (LOS), and delays in the admission or discharge of patients (Sullivan et al, 2016). Although this statement may seem trivial, it is crucial in terms of improving quality indicators and improving patient care outcomes.

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It is important to understand that the problem of overcrowding is multifactorial. Studies have found that a slow triage process can lead to ED overcrowding, prolonged wait times, and extended lengths of stay (Van der Linden et al., 2016). Other factors that have been associated with ED overcrowding are reduced access to primary healthcare centres, an aging population that has increased demand for complex chronic disease management, and decreased service availability (Ackroyd-Stolarz et al., 2011; Bullard et al., 2009; Legramante et al., 2016). Despite efforts to address some of these issues, the problem of overcrowding remains to be solved in most countries.

Understandably, prolonged wait times can frustrate patients, negatively affect their perception of care, contribute to high morbidity and mortality rates, and increase aggression toward staff, as well as reduce staff retention and satisfaction (Ackroyd-Stolarz et al., 2011; Thompson et al., 1996; Shah et al., 2015). Addressing congestion in the ED could help increase satisfaction amongst patients and staff in the ED.

Emergency department functioning is best conceptualized using three phases: input, throughput, and output (Asplin et al.2003). Strategies specific to each phase are often proposed, such as ambulance diversion, to reduce ED input, fast-tracking patients, and accelerated triage and registration to improve throughput, and the use of discharge protocols, for output and protocol development (Shah et al., 2015; Yarmohammadian et al., 2017). However, some of these interventions have shown mixed results concerning reducing wait times, and facilitating patient satisfaction. Patients continue to express frustration with the wait times despite attempts to improve care through different interventions, and some leave without being seen (LWBS) by a care provider, which can adversely affect safety, the general quality of healthcare, and experiences of care (Bonalumi et al., 2017). Therefore, understanding the exact delay points in care may help us better serve patients seeking care in the ED and improve patient-care outcomes.

The purposes of this study were to determine the wait times at a community hospital ED, and explore the exact points where delays happen. We also explored patients' satisfaction with the experience of seeking care in relation to their length of stay.

## Theoretical Framework

This study was guided by Watson's theory of human caring (Watson, 2006; Watson 1996). We found this theory applicable to our study as caring behaviour could contribute to patient's satisfaction, wellbeing, and organizational performance (Kaur et al., 2013). Guided by the three vital concepts of the theory (transpersonal caring, the caring moment, and 10 caritas processes; Watson, 2006), the nurses or researchers are able to provide "value guided vision of care" (Watson, 2006), which will, in turn, reduce ED wait times and improve patient satisfaction. As Watson's posits, "Any profession that loses its values becomes heartless, any profession that becomes heartless becomes soulless, any profession that becomes heartless and soulless becomes worthless" (Watson, 2006., p.49).

## Methods

### Study Setting

This Quality Improvement (QI) project was conducted at a community hospital emergency department in British Columbia, Canada. The facility is a level IV trauma hospital and receives approximately 20,000 ED visits annually.

All patients aged 18 years and above visiting the ED were eligible. Exclusion criteria include:

1. Canadian acuity triage scale (CTAS) level 1 (one; patients requiring resuscitation)
2. acute psychotic patients requiring a code white
3. pediatrics patients (under 18 years)
4. pregnant women >20 weeks in active labor.

### Design

This is a QI project using a descriptive cross-sectional design. This design was chosen to accurately and systematically describe the ED wait times, and to understand the patients' experience of care. Using this design, we were able to answer the following questions:

a. What are the wait times and delay points at the emergency department?
b. What is the experience of patients seeking care in emergency departments in relation to their length of stay?

### Data collection

Using convenience sampling, participants for this QI project were recruited between April 1 and May 1, 2021. Institutional clearance and approval was obtained prior to data collection (Fraser Health, 2021). The data collection tool included a questionnaire with 20 open- and closed-ended questions divided into three sections. The closed-ended questions assessed demographic data, such as age, gender, ethnicity, and educational level. In the second part of the questionnaire, participants were directed to record time spent at each point of care seeking journey (e.g., triage, nurse assessment, physician assessment and imaging).

The last section of the questionnaire included a list of questions that were adapted from a previously published study by Shah et al. (2015), because of similar context and research questions. The questions aimed to capture the patients' experiences at the ED. Participants were asked to rate their ED experience using a Likert scale ranging from 1(very poor) to 5 (very good) about the wait time, courtesy of the staff, the level at which they were kept informed and their overall rating of the ED experience.

The research team who collected the data consisted of two Registered Nurses (RNs), two Licence Practical Nurses (LPNs) and one care aid/screener. After unit-specific approval was obtained, 205 copies of the data collection tool were printed and distributed to the research team. The research team gave participants the questionnaires at registration and asked them to place their completed questionnaire in a box at the exit of the hospital before leaving the hospital. However, only a few questionnaires were deposited in the box, as patients were not placing them in the right spot. Therefore, the data collection team revised its distribution plan and, instead, checked in frequently with the participants or the nurse on duty to collect the questionnaires.

**Data analysis**

Data were recorded on paper questionnaires and then entered on an Excel spreadsheet (Microsoft Excel 2021) by the first author and other research team members. Data entry was validated by the second author. Data were analyzed using Statistical Package for the Social Sciences (IBM SPSS Statistics, version 26, 2019). Categorical data (e.g., demographics, patient experience survey) are summarized as frequencies and percentages, while continuous data are summarized as median and interquartile range (IQR). We chose to use the median and IQR because data were skewed and those the appropriate measures of central tendency.

In this study, we used the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines as a validation tool/framework for ensuring high-quality presentation of this study (Von Elm et al., 2008).

## Results

A total of 167 questionnaires were analyzed; 38 (19%) were excluded because 34 questionnaires had not been returned and four had incomplete data (Table 1). The age of the respondents ranged from 18 to 101 years, with the majority being older than 75 ($n$ = 30, 18%). There were more females ($n$ = 85, 51%) than males ($n$ = 80, 48%) or queer individuals ($n$ = 2, 1%). Sixty-two (37%) of the respondents were high school graduates and 14 (8%) had less than high school education. Meanwhile, 44 (26%) had college certificates and 24 (8%) held a Masters' degree or higher. Respondents were from various ethnic backgrounds, but the majority were Caucasian ($n$ = 96, 58%), Asian ($n$ = 36, 22%) and First Nations ($n$ = 6, 4%).

The vast majority (103, 62%) of the participants sought care during the hours of 0600h to 1400h, with the least number of patients seen between 2200h to 0600h (15, 9%). Most of the participants visited the ED on Thursdays: (29, 17%), while fewer participants sought care on Tuesdays and Wednesdays (19, 11%) during the duration of the study.

## Time intermissions

In this study, we captured 10 points of care representing the patient journey in the ED. The time points include

1. registration to triage nurse assessment
2. triage to laboratory tests
3. triage to imaging tests (contrast tomography [CT], electrocardiogram [ECG], X-ray, ultrasound [US], magnetic resonance imaging [MRI]).
4. triage to placement in the room (nurse assessment)
5. nurse assessment to tests (laboratory tests, imaging, and electrocardiogram)
6. nurse assessment to physician assessment
7. physician assessment to laboratory tests
8. physician assessment to Imaging
9. tests to physician reassessment
10. total time spent in the ED.

Although the above time points are a typical ED workflow, not all patients pass through each point of care during their ED visit. The need for each point of care is per patient's condition and needs. However, each patient passed through registration to triage before proceeding to other points of care, if necessary.

Once the data were collected, the total time spent in the ED was calculated. Since the data were skewed, we used the median and interquartile range (IQR) to report time spent at each point of care. The median time from registration to triage and triage to nurse assessment were 11 and 35 minutes respectively (Table 2). Median time from nurse assessment to physician assessment was 45 minutes. The time between undergoing testing to physician reassessment median time was 65 minutes. Overall, median time spent in the ED was two hours fifty-five minutes (175 minutes). The delay points based on the findings include tests to physician reassessment, with a median time of 65 minutes, physician to Imaging median time, 52 minutes, and nurse to physician assessment with a median time of 45 minutes.

Participants rated wait times as 4 (good) on a Likert scale from 1 (very poor) to 5 (very good; Table 3). Similarly, patients responded positively about being informed about delays (50 %). In response to their overall experience at the ED, 49% ($n$ = 82) of the respondents selected five (very good) on staff courtesy. Furthermore, 46% ($n$ = 77) of respondents chose very good information on wait times, and 60% ($n$ = 100) recommended this ED to others. However, 28% ($n$ = 47) of the respondents rated the ED as poor (2), and 42% ($n$ = 70) perceived their wait times long.

## Disparity in experience

Evidence suggests patients of various ethnic backgrounds, particularly Indigenous people of Canada and those of African descent, encounter negative experiences in the ED (Goodman et al., 2017; Turpel-Lafond, 2020). Thus, additional analyses were performed to explore the association between self-reported ethnicity and ED experience. Regarding staff courtesy, overall, Caucasians had a wide range of responses from very poor ($n$ = 3, 3%) to very good ($n$ = 49, 53%; Table 4). Participants who identified as Asian Canadians had similar responses from very poor ($n$ = 1, 3 %) to very good ($n$ = 49, 53%). Participants identifying as indigenous Canadians ($n$ = 3, 50%), African Canadians ($n$ = 2, 50%), and other ethnic groups ($n$ = 7, 47%) rated staff courtesy as very good (5) on a Likert scale of 1–5 (1 very poor and 5 very good). For overall ED ratings, most Caucasians (28, 33%) rated the ED as poor. Similarly, 3 (50%) of First Nations participants rated the ED as poor (2) and other ethnic groups (33 %). However, most of the participants who identified as Asian Canadians (11, 31%) rated the ED as good (Likert 4). Due to the small sample size, we could not perform subgroup analysis by ethnic group.

Discussion

Our study aimed to determine wait times, delay points in the ED, and assess patient satisfaction with ED experience. The median total ED wait time was 175 minutes (a quartile range of 100 to 264 minutes), with the longest wait being from diagnostic turnaround time to physician reassessment (median 65 mins) and the shortest wait time being from registration to triage (median time 11 minutes).

These wait times were not surprising, because blood samples have to be collected and transported before being analyzed.

Point of Care Testing (POCT) is a quality improvement intervention that has been shown to reduce ED length of stay (Eitel et al., 2010). Introducing POCT to the ED and training ED staff to conduct laboratory tests has been shown to decrease laboratory turnaround time in various facilities and overall ED length of stay (Eitel et al. 2010).

Similarly, patients waiting for imaging must wait for a porter to transport them to imaging when the department is ready for them. In addition, this facility has limited imaging equipment (MRI, CT, and US) for both inpatients and outpatients. That said, it is essential to look at models that can improve the wait times. The lean model seeks to enhance ED performance and meet customers' needs by reducing complexity and improving unnecessary or non-value-added activities (Improta et al., 2018). This process can be achieved by following the theoretical path of the patient and applying tools that would reduce unnecessary waits from arrival to discharge. Further, lean thinking involves a re-engineering process that improves the management of medical reports from imaging by applying accurate notifications when messages are ready. This model demonstrates that applying the lean methodology to all points of care can improve flow and ED wait times.

Another way to apply lean principle to improve front-end care models and improve patient flow is to eliminate traditional triage and have a multidisciplinary care team assess patients on arrival. These proposed lean strategies have shown positive results in reducing wait times and improving ED flow (Rutman et al., 2015).

In a study investigating a relationship between patient satisfaction and communication of expected wait times, most patients were more likely to accept longer wait times provided their expectations were managed via communication (Shah et al., 2015). This finding suggests that patients would like to be informed about the wait times to meet their expectations and a more customer service-centred approach may achieve this finding.

Most participants rated the overall ED wait times as poor ($n$ = 47, 28%). The high percentage of poor rating was surprising, especially given that most of the participants (100, 60%), indicated that they would recommend this ED to others. This finding may suggest that the patients are unhappy about the long wait times, but they like the service they received in the ED, or this could be the only ED in the area and participants may not want to travel longer distances for ED services.

Studies have found patient satisfaction plays a crucial role in the healthcare system, as an indicator of the quality of care (Mohanan et al., 2010). A study done in Portugal found that overall "satisfaction with doctors" and "feeling that expectations have been met" are the main predictors of satisfaction and perceptions of healthcare (Abidova et al., 2020). Other studies have found that nursing care, including keeping patients informed about delays and keeping family and friends informed, is also significantly associated with patient satisfaction (Boudreaux et al., 2000; Wiley, 2017). These findings are essential for quality improvement and reduce patient dissatisfaction with care even when the wait times are long.

**How Watson's theory of Care informed our Project**

The primary goal of this project was to infuse Jean Watson's theory to practice as a way of humanizing healthcare workers in practice, so they understand the patient's points of delay in the ER. Implementing this model has been an enlightening journey; observing how the nurses interact with patients and families as they wait to be seen showed how important it is for nurses to know themselves and others. When patients and family members continued to ask nurses how long the wait times were, nurses would avoid looking the patients/families in the eyes because of not knowing what to say. As a result, patients were frustrated because of the length of stay and would stop participating in the study. Using Watson's theory in our project helped the nurses reflect on the "meaning of what it means to be human, to be vulnerable, to be ill, to be cured, to healthy, and to be healed" (Watson, 2006, p.48). This theory also helped us drive away from the traditional healthcare model that leans toward economy, budgets, and administration to humanizing healthcare. Nurses participating in this QI project took time to explain the project purpose to the participants and how the results would help identify the points of delay.

**Limitations of the study**

The major limitation of this study was that our questionnaire failed to capture data on patients waiting for specialist consultations, as this might be another point of delay in the ED. We recommend that future research incorporate consult wait times in data collection. Another potential limitation is social desirability bias. We found that some patients might have been uncomfortable rating the institution or staff because the research assistants were employees of the institution. One participant stated, "I do not want to get anyone in trouble," and another participant wrote, "The staff are doing a great job. Pay them more." In other words, the participants believed that the institution was surveying the staff. Future research should have research assistants state the purpose of the study, use non-employees for data collection or employ anonymous methods to capture the information. Lastly, we did not collect the Canadian Triage and Acuity Scale (CTAS) level or understanding of the patient, because this would have required us to access the health charts. Future studies should look at the association between the patient's acuity level and their ED wait time.

**Conclusion**

Improving ED throughput remains a top priority for healthcare administrators in Canada. Long ED wait times have been associated with adverse effects on the institution, patient care outcome, and staff morale. This quality improvement project found that the longest wait time is from tests to physician reassessment, followed by triage to imaging. To improve ED throughput, we suggest implementing the Lean Model, which has been shown to improve the efficiency of services, reduce wastes and improve quality of care. Further, establishing a POCT centre in the ED may help expedite test results and reduce patients' time for those tests and results. Finally, future studies should look at the causes of delays at imaging or laboratory and quality improvement projects that will expedite wait times and reports.

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*None reported.*

## Conflicts of interest

*The primary author is an employee of the hospital where the project was conducted.*

## Contribution of the authorship team & CRedIT author statement

***Jenipher Kayuni Mtambo:*** *Conceptualization, investigation, data curation, interpretation, software, writing - original draft preparation.* ***Prof. Dzifa Dordunoo:*** *Supervision, conceptualization, software, methodology, validation, data analysis and interpretation visualization.* ***Prof. Anastasia Mallidou:*** *Visualization, supervision.* ***Pamela Marquard (LPN), Mitchell Mohan (RN), Alyssa Nickle (RN), and Catherine Mastine (LPN):*** *Investigation (data collection), review and editing of the draft.*

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# Use of social media and Free Open Access Medicine (FOAM) for continuing education in emergency nursing: A scoping review

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## Abstract

**Introduction:** Emergency nurses are responsible for ensuring that they have up-to-date knowledge and skills to deal with any situation that may present in clinical practice. As an emerging trend for learners to obtain and discuss evidence-based medical education, social media, Free Open Access Medical education (FOAM) and Free Open Access Nursing education (FOAN) could be used for continuing education in emergency nursing. This scoping review aims to discover what is known about social media and FOAM in continuous emergency nursing education.

**Methods:** This scoping review was guided by Arksey and O'Malley's framework for scoping reviews and checked against the Preferred Reporting Items for Systematic Reviews and Meta-Analyses – Extension for Scoping Reviews (PRISMA-ScR). A database search was performed on papers that discussed social media or FOAM in the context of continuing education in either general or emergency nursing published in any year.

**Results***:* Of the 369 records screened, 12 papers were reviewed. Of these, 58% of papers were from either Canada or the United States, 67% of papers were published in 2016 or after, and 50% were conceptual in nature. Two major categories these papers focused on were how social media was used, and the limitations of using social media for continuing education.

**Discussion**: The current state of literature is limited in describing the use of social media with continuing education, specifically in emergency nursing. Rather than as a primary educational intervention, social media has been used to enhance other educational strategies or as in-the-moment forms of learning. Studies that utilized social media showed favourability to its use, but there were often challenges to the methodology of these studies.

**Conclusion***:* Although the literature on social media in emergency and general nursing literature is growing, it is superficial and broad. More studies are needed to see the overall effects of social media in continuing education in emergency nursing.

*Keywords:* continuing education, emergency nursing, nursing education, social media.

## Introduction

Emergency department (ED) nurses are expected to manage the care of patients with diverse health needs and ailments across the clinical spectrum. Nurses may have

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to deal with cardiac emergencies, pediatric presentations, mental health crises, or complex geriatric care on any given shift. Consequently, nurses must possess up-to-date knowledge and skills to deal with each of these presentations as they arrive in the ED. Competing educational interests and the demand for current, evidence-based knowledge challenges emergency nurses to engage in continuing education activities to remain competent in their practice, as required by all nursing regulatory bodies in Canada (Valdez, 2009).

Entry-to-practice educational requirements for emergency nursing are largely varied and may not necessarily include advanced post-baccalaureate education (Jones et al., 2015). Historically, emergency nurses utilized continuing education strategies to ensure they had the required knowledge and skills to work in emergency departments (Schriver et al., 2003). Although many emergency departments now offer a comprehensive onboarding-to-practice program, continuous learning opportunities are still mandated to ensure that staff are up-to-date and familiarized with current practices crucial to positive patient outcomes (Canadian Nurses Association, 2004; Schriver et al., 2003). Most approaches for continuing education include didactic face-to-face instruction and interval-based accredited courses, such as Advanced Cardiac Life Support (ACLS; Allen et al., 2013; Koota et al., 2018).

Obtaining effective emergency education is challenged by several factors. First, practice standards for emergency nursing vary between hospitals, regions, and countries, so the needs of one particular group of nurses may be substantially different from others (Jones et al., 2015). For example, management of patients on mechanical ventilation is a competency for a sizeable minority of emergency nurses in the United States (Rose & Ramagnano, 2013). Second, there is tremendous variability in the clinical procedures and tasks that ED nurses may see daily. For example, critical care tasks such as chest tube management and cardioversion are performed far less often and amongst fewer nurses than venipuncture and wound care management (Dağ et al., 2019; McCarthy et al., 2013). Within emergency nursing, these high-acuity, low-opportunity (HALO) procedures are prone to the effects of knowledge and skill decay without additional practice or educational refreshers (Kardong-Edgren et al., 2019). Third, numerous barriers limit nursing action to educational opportunities. Factors such as cost of education, time away from work, lack of funding, nursing shortages, and lack of access to in-person offerings can reduce engagement with educational opportunities (Laflamme & Hyrkas, 2020; Nalle et al., 2010; Wolf & Delao, 2013). For example, rural settings may not have qualified facilitators or resources to provide education. More recently, the COVID-19 pandemic has limited the availability and ability to attend in-person educational activities (Weiss et al., 2021).

Given the challenges in obtaining continuing emergency nursing education, there is a need for educational strategies that can be individually targeted and easily accessible to emergency nurses. Social media is one strategy that is becoming more accepted in nursing education. YouTube videos, for example, are self-reported to be integral to nursing students' education as much as textbooks and offline media have been previously (Duke et al., 2017; Montayre & Sparks, 2018). Social media learning aligns with constructivist principles, as learners are utilizing resources that meet their specific needs and preferences (Flynn et al., 2015). Furthermore, learners who choose to engage in social media discourse can reflect on previous experiences and link them to the topic being discussed (Mbati, 2013). However, generational differences between students and faculty, distrust of social media platforms due to privacy concerns, and the risk of accessing erroneous content has led to challenges in adopting social media in the health professions community (Duke et al., 2017; Gooding & Swift, 2019).

One such strategy increasingly used by physicians in the emergency medicine community is Free Open Access Medical education (FOAM or FOAMed). FOAM is an encompassing term that refers to current, open-access and evidence-based medical education generated by and freely available online to the healthcare professional community (Nickson & Cadogan, 2014). While FOAM is primarily known for disseminating free and open-access medical education content over social media platforms, it also involves engaging researchers, educators, and clinicians to use these materials to improve patient care through critical discussions and sharing experiences (Chan et al., 2020). Free Open Access Nursing education (FOAN or FOANed) is a similar movement that focuses on materials relevant to nursing practice and on the online collaboration of nurses (Stevens & Nies, 2018). For the purpose of this paper, our discussion on the use of FOAM will be inclusive of FOAN resources, considering their similar paradigms.

The variety of FOAM content covers the spectrum of pathophysiology, evidence-based interventions, and skill development – many of which align with the emergency nurses' learning needs. There is also utility amongst emergency nurses due to the blurring of roles and tasks between physicians and nurses who work in emergency departments (Brook & Crouch, 2004). For example, simple suturing is a procedure that may be within the scope of emergency nurses in specific jurisdictions (Middleton, 2006). Despite that, it is not well established how FOAM can be utilized as a part of a continuing education strategy in emergency nursing. There is growing literature over the past decade on FOAM in emergency medicine, but the body of literature within nursing – let alone emergency nursing – is much smaller (Chan et al., 2020). While there have been many literature reviews on the use of social media in the undergraduate nursing student population, to our knowledge there are no previous scoping or systematic reviews conducted on FOAM in emergency nursing continuing education. While there have been unstructured literature reviews on the use of social media in the undergraduate nursing student population, to our knowledge there are no scoping or systematic reviews conducted on FOAM in the context of emergency nursing continuing education. Our scoping review was conducted to summarize what is currently known about social media and FOAM in the context of emergency nursing education.

## Methods

A scoping review has been chosen for this study as the literature on this topic is relatively small and recent. Grant and Booth (2009) describe scoping reviews as "a preliminary assessment

of the potential size and scope of the available research literature" (p.101) without the rigorous quality assessment associated with a systematic review. They are particularly useful for areas of emerging research with a lack of high-quality research studies (Levac et al., 2010). As our research questions aim to answer *what is known* within the growing field of social media, FOAM, and emergency nursing, the methodology of the scoping review best aligns with the aims of our study.

The methodology for this scoping review is informed by the framework proposed by Arksey and O'Malley (2005). In their framework, the scoping review is divided into five stages that parallel the process used to conduct a systematic review: (1) identifying the research questions; (2) identifying relevant studies; (3) selecting studies; (4) charting and documenting the data; and (5) summarizing and reporting the results. The remaining sections of the methods will be structured per the first four components of Arksey and O'Malley's (2005) framework; the last component will be covered in the results. This scoping review will be checked against the Preferred Reporting Items for Systematic Reviews and Meta-Analyses - Extension for Scoping Reviews (PRISMA-ScR; Tricco et al., 2018). The PRISMA-ScR contains 20 items that should be reported with the scoping review, so that readers can assess the quality of the review. The checklist pertinent to this review is available in Appendix A. A protocol for this review was not published previously.

**Identifying the research questions**

As there is an increase in social media being used for nursing education, and there is a substantial amount of FOAM resources geared towards emergency medicine, this scoping review aims to answer the following questions:

1. How is social media, FOAM, and FOAN used in continuing education for emergency nurses?
2. What challenges are there to adopting social media, FOAM, and FOAN in continuing education for emergency nurses?

**Identifying relevant studies**

*Search strategy*

A comprehensive literature search was performed in the MEDLINE, CINAHL, and ProQuest Web of Science databases in May 2021 and May 2023. A preliminary search was also performed on EMBASE Conference Proceedings and ProQuest Dissertations and Theses Database (PQDT), but no relevant papers were discovered on these databases. The search strategy looked for any academic or scientific papers that involved our population (emergency nurses), concept (usage of social media, FOAM, or FOAN) and context (continuing education or professional development). A trained medical librarian peer-reviewed the final search strategy that was used, based on our target population and previous literature reviews on social media in the education of healthcare professionals. Google Scholar was used to help corroborate our search strategy by mapping the first 200 citations with known papers that met inclusion criteria. The search strategy is available in Appendix B. After obtaining the initial set of included papers, a search of the references from each paper was completed to identify other relevant works.

*Study eligibility*

Any scientific paper that discusses the use of social media, FOAM, or FOAN for continuing education in emergency nursing or general nursing was included. The educational intervention must have been open-access and freely accessible. Both emergency nursing and general nursing were included, as many topics in general nursing overlap within the emergency nursing domain. There was no restriction to the type of publication, language of publication, setting of paper, or date of publication. If papers were not available in English, the paper was translated using Google Translate. Papers that discussed social media, FOAM, or FOAN in the context of undergraduate medical or nursing education were excluded, as we were focused on continuing education and professional development. These inclusion and exclusion criteria are summarized in Table 1.

**Table 1**

*Inclusion and Exclusion Criteria*

| | Inclusion | Exclusion |
|---|---|---|
| Population | Nurses (excluding nursing students) | All other health care professionals and nursing students |
| Concept | Discusses FOAM, FOAN, or social media education | Discusses education strategies that are neither free nor open-access |
| Context | Discusses continuing education or professional development | Does not discuss education at all |
| Type of Literature | Any scientific paper | |
| Language of Publication | Any language | |
| Country of Publication | Any country | |
| Date of Publication | Any date | |

**Selecting studies**

Data from the literature search was captured in the reference management software Zotero and then exported to Covidence software, which all reviewers were trained on how to use. Three researchers (FT, RO, ES) reviewed the papers captured by the literature search. The inclusion and exclusion criteria were refined once after an initial review of fifty items to ensure a broad capture of papers for review. Each item was randomly assigned to two of the researchers who screened titles and abstracts based on the full study eligibility criteria. Duplicate items were removed automatically by Covidence software and manually by reviewers. For any conflict, such as uncertainty on inclusion and exclusion criteria, the third researcher resolved any uncertainties

or disagreements. Cohen's kappa (κ) was used to assess inter-rater agreement, and deliberation on initial study selection was completed with κ = 0.91. After the initial study screening, papers that met initial eligibility criteria underwent a full-text review for further screening of eligibility criteria and data collection by the same researchers who performed the initial screen.

**Charting and documenting the data**

Three researchers (FT, RO, ES) worked together to do the data extraction. Each paper was randomly assigned to two of the researchers to code the data; if required, the third researcher was brought in to resolve any disagreements. Data collection was completed using a standardized data collection form created in Google Forms (see Appendix C). Data entered in the form was stored in Google Sheets. Data extraction items included bibliographic information (article title, type of publication, year of publication, country of first author) and article information relevant to the research questions. As it is not required for a scoping review, a formal quality assessment for each paper was not conducted. The same researchers iteratively coded and categorized the data based on the initial research questions. When applicable, the type of scholarship (description, justification, and clarification) of the study is identified as per Cook, Bordage, and Schmidt's framework for classifying medical education research (Cook et al., 2008).

## Results

The literature search retrieved 441 potential citations. After filtering for duplicate reviews, there were 369 records that were screened and 28 records that were included for full-text analysis. Eighteen additional papers were reviewed following a snowball search of the references in all included papers. However, none of these papers met inclusion criteria. See Figure 1 for a flow diagram of the search process.

**Study information**

Twelve papers met inclusion criteria and were analyzed for this review. The majority of the included papers were from primarily English-speaking countries including Australia (*n* = 1, 8%), Canada (*n* = 1, 8%), United Kingdom (*n* = 2, 17%), and the United States (*n* = 6, 50%), with one study each from Brazil and Saudi Arabia. All papers were written or available in English. Nearly all of the identified papers and studies (*n* = 10) were situated from the general nursing context; only two papers were within the emergency nursing context (Bakhsh & Perona, 2019; Hernandez et al., 2019). The majority of papers (*n* = 8) were published in or after 2016 (Almeida et al., 2018; Bakhsh & Perona, 2019; De Sousa et al., 2018; Hernandez et al., 2019; Jackson, 2017; Pilcher & Harper, 2016; Pizzuti et al., 2020; Reinbeck & Antonacci, 2019). The majority of papers (*n* = 7) were largely conceptual in nature and talked about how social media or a specific social media platform could be used for education (Almeida et al., 2018; Billings, 2009; Bristol, 2010; Moorley & Chinn, 2015; Pilcher & Harper, 2016; Reinbeck & Antonacci, 2019; Wilson et al., 2014). The remaining papers discussed either an intervention or survey with respect to social media (Bakhsh & Perona, 2019; De Sousa et al., 2018; Hernandez et al., 2019; Jackson, 2017; Pizzuti et al., 2020). Those that described an intervention were largely justification-type studies (Bakhsh & Perona, 2019; De Sousa et al., 2018; Hernandez et al., 2019).

**Figure 1**

*Article Screening Process*

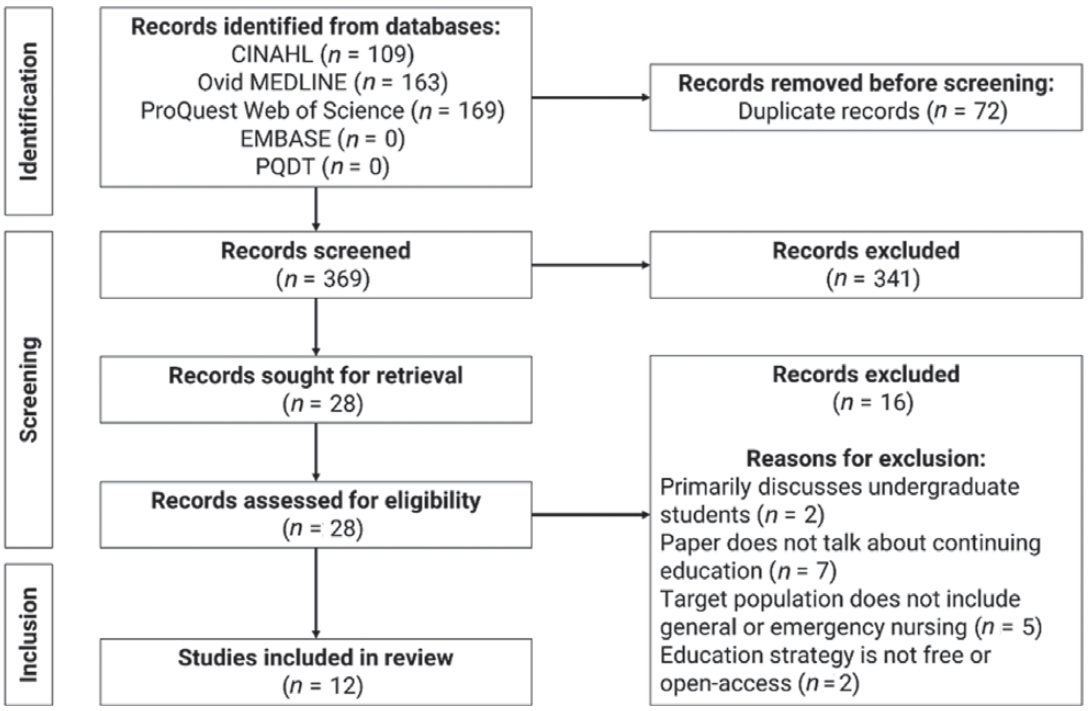

**Table 2**

*Summary of Studies Included in Scoping Review*

| Author | Year Published | Country of First Author | Type of Paper | Social Media Platforms Discussed | Study Design | Use of Social Media in Continuing Education |
|---|---|---|---|---|---|---|
| Almeida et al. | 2018 | Brazil | Review | Blogs[a] | Not applicable. | Other than noting that blogs can be used, there are no details on its effectiveness or impact. |
| Bakhsh & Perona | 2019 | Saudi Arabia | Justification Study | YouTube[b] | *Population*: emergency department staff. Retrospective chart review. The authors were reviewing the outcomes of an educational intervention to decrease ondansetron usage using a combination of YouTube videos, posters, and one-one discussions. | The combination of educational interventions (including the YouTube video) did have an impact, but it's unclear what the relative effect of YouTube was on the outcome. |
| Billings | 2009 | United States | Conceptual | Blogs, Wikis[c] | Not applicable. | Examples are provided on how blogs and wikis can be used for continuing education, but no details on their effectiveness are provided. Authors warn of potential patient confidentiality concerns. |
| Bristol | 2010 | United States | Conceptual | Twitter[d] | Not applicable. | Examples are provided of how Twitter can be used for education, but no details on its effectiveness or impact are provided. Authors warn of potential patient confidentiality concerns. |
| De Sousa et al. | 2018 | Canada | Justification Study | Facebook[e], Instagram[f] | *Population*: hospital nurses. N = 60 (post-intervention) Evaluative survey on hypoglycemia management before and after educational interventions were provided on social media (Facebook, Instagram) and in-person. Facebook views of the educational intervention were also assessed. | There was no significant increase to nursing knowledge with the use of social media. It was also noted that viewing of the educational intervention on social media decreased over time. |
| Hernandez et al. | 2019 | United States | Justification Study | YouTube | *Population*: emergency nurses. N = 37 (post-intervention) Survey on STEMI identification pre- and post-educational intervention that used a combination of a free continuing-education platform and material delivered on YouTube. | Use of educational interventions were subjectively well-received by nursing and there was an increase in post-intervention knowledge scores (from 7.53/10 to 9.11/10). |

| | | | | | | |
|---|---|---|---|---|---|---|
| Jackson | 2017 | United Kingdom | Descriptive | Facebook, Instagram, Twitter | *Population*: hospital nurses. Description of an educational intervention to use images on various social media platforms to increase mobilization of in-hospital patients. | Front-line nurses reported seeing the images and had positive attitudes to the intervention, but no further details on effectiveness were reported. The authors describe the intervention as simple to use and cost-effective. |
| Moorley & Chinn | 2015 | United Kingdom | Conceptual | Blogs, Facebook, Twitter, YouTube | Not applicable. | Examples are provided on how social media could be used for professional development, but no details on its effectiveness are provided. |
| Pilcher & Harper | 2016 | United States | Conceptual | Facebook, Twitter, Pinterest[g] | Not applicable. | Examples are provided on how social media could be used for professional development. They do note that social media currently is used to "augment educational activities" and that there is limited research to guide users on how it could be used. Authors warn of potential patient confidentiality concerns. |
| Pizzuti et al. | 2020 | United States | Descriptive | None specifically | *Population*: healthcare professionals<br>N = 1113 (nursing only), 1644 (total)<br>Survey of healthcare professionals on social media, with questions specifically targeting education. | 85.8% of nurses are favourable to using social media for educational purposes, usually as recipient rather than creator. |
| Reinbeck & Antonacci | 2019 | United States | Conceptual | Blogs, Facebook, LinkedIn[h], Twitter, YouTube | Not applicable. | Examples are provided on how social media could be used, but no details on its effectiveness are provided. Authors warn of potential patient confidentiality concerns. |
| Wilson et al. | 2014 | Australia | Conceptual | Twitter | Not applicable. | The authors note that social media can provide nurses with quick access to educational material, but that nurses are often not taught to navigate the social media landscape. Authors warn of potential patient confidentiality concerns. |

[a] Blogs are websites where information (such as photos, videos, or text) can be shared, typically focusing on a particular subject or topic.
[b] YouTube is an online platform for sharing videos.
[c] Wikis are an online database of information where content is created, edited, and managed by a group of users.
[d] Twitter is an online platform where users can publicly post images, videos, and brief snippets of texts, usually about current or real-time events. In July 2023, Twitter was renamed to X. As this occurred after our literature search and analysis, this paper will continue to refer to this platform as Twitter.
[e] Facebook is an online platform where users can post images, videos, and texts to either the public, to user-designated "friends" or within common-interest groups.
[f] Instagram is an online platform for sharing photos and videos.
[g] Pinterest is an online platform for sharing images and videos found on other websites or social media platforms.
[h] LinkedIn is an online platform used primarily for professional networking, though users can also share photos, videos, and texts to other members.

Of the social media platforms that were identified, Facebook (De Sousa et al., 2018; Jackson, 2017; Moorley & Chinn, 2015; Pilcher & Harper, 2016; Reinbeck & Antonacci, 2019), Twitter (Bristol, 2010; Jackson, 2017; Moorley & Chinn, 2015; Pilcher & Harper, 2016; Reinbeck & Antonacci, 2019; Wilson et al., 2014), and YouTube (Bakhsh & Perona, 2019; Hernandez et al., 2019; Moorley & Chinn, 2015; Reinbeck & Antonacci, 2019) had the most mentions. Neither FOAM nor FOAN was explicitly mentioned in any of the included papers that were targeted to nursing. All studies that were included are summarized in Table 2.

The use of social media in nursing continuing education has largely been, as Pilcher and Harper describe, to "augment educational activities" rather than as primary educational interventions (Pilcher & Harper, 2016). The use of hashtags on Twitter, for example, allows nurses to selectively choose topics they find relevant at the moment (Bristol, 2010; Moorley & Chinn, 2015; Pilcher & Harper, 2016; Reinbeck & Antonacci, 2019; Wilson et al., 2014). Access to social media in the clinical setting can provide users with quick access to practical material in the moment (Wilson et al., 2014). Unlike other offline activities, social media provides nurses with the opportunity to engage in educational discourse with other healthcare professionals (Almeida et al., 2018; Billings, 2009; Bristol, 2010; Moorley & Chinn, 2015; Pilcher & Harper, 2016; Reinbeck & Antonacci, 2019; Wilson et al., 2014). These opportunities give nurses agency to begin the conversation, rather than simply be receivers of healthcare education.

The focus of most conceptual papers reviewed was on describing what a particular social media platform was, how the platform was used, and specific cases that demonstrate how nurses could use that social media platform. Discussions of social media are largely favourable for the specific instances they describe, with caution to navigating the social media landscape and avoiding the pitfalls of privacy breaches. Only two papers in this review discussed a more general or systematic approach to utilizing social media for continuing education (Pilcher & Harper, 2016; Wilson et al., 2014).

Only one paper in the literature reviewed examined the perceptions of nurses with regards to social media in continuing education (Pizzuti et al., 2020). They identified that amongst nurses, Facebook and Pinterest were the platforms most often used for educational purposes. Within that population, approximately 85.8% of nurses were favourable to using social media for educational purposes with 40.5% having done so already. However, the usage of social media for education was largely passive with no direct involvement of nurses in the creation of the material or discussion of the results on social media posts.

When social media was used as an educational intervention, its usage was limited to a single educational topic such as usage of antiemetics with opioids, management of hypoglycemia, identification of ST elevation on cardiac ECG, or best practices on early mobilization (Bakhsh & Perona, 2019; De Sousa et al., 2018; Hernandez et al., 2019; Jackson, 2017). The use of social media in these studies was largely favourable, with respondents marking ease-of-access and visibility of intervention highly. However, these studies also described numerous challenges to measuring the effects of social media on learning as it was difficult to measure participation by the study population and difficult to link learning outcomes to the social media activity. The use of YouTube videos in one study, for example, was supplemented by other in-person educational activities such as posters and one-on-one discussion (Bakhsh & Perona, 2019). In another study involving Facebook and Instagram posts, viewership of the educational material progressively declined over time (De Sousa et al., 2018).

**Limitations of social media in continuing education**

All papers described some form of challenge or barrier in the update of social media as part of a continuing education strategy. The most often described challenge is the caution nurses need to take to maintain patient privacy and confidentiality (Billings, 2009; Bristol, 2010; Pilcher & Harper, 2016; Wilson et al., 2014). The ramifications of confidentiality and privacy breaches in social media can result in the dismissal of the employee (Reinbeck & Antonacci, 2019). Several jurisdictions have begun to create policies and guidelines to guide nurses and other healthcare professionals to ensure privacy and confidentiality is maintained (Pilcher & Harper, 2016; Wilson et al., 2014).

Nurses are also cautioned to ensure that the content they are reviewing on social media is accurate and legitimate. Digital literacy is often not part of undergraduate nursing education, yet is important in navigating the overwhelming number of social media posts available (Wilson et al., 2014). Since social media platforms are open-access, educational content may often be mired by unsubstantiated, "popular" thought or content posted by scam accounts. However, the discussion or comments section of social media posts are largely open and visible to everyone, allowing for an informal method of peer review to occur (Moorley & Chinn, 2015).

## Discussion

The aim of this scoping review was to summarize what was known about social media and FOAM in the context of emergency nursing education and we found that there was limited information about this in the current literature. The majority of papers were descriptive or conceptual and describe the usage of social media at a superficial level. The number of research papers that utilized social media as an educational intervention were lacking, and of those that did it was unclear if there were better assessment scores because of social media. However, this was contrasted with favourability amongst participants in engaging with and using the social media platform for education.

Unlike earlier discussions in the health professions literature on social media that were primarily descriptive of the platform, there are more papers over the last decade that describe general strategies to engage with social media (Thoma et al., 2014). Of note, the emergency medicine literature has readily adopted the usage of FOAM and there are an increasing number of papers that discuss frameworks that underpin the usage of social media and FOAM in education (Chan et al., 2018). These frameworks provide general direction for users to effectively obtain FOAM resources and to engage with other members of the FOAM community. There are also a growing number of tools for providers to critically appraise the content

of FOAM resources such as the ALiEM AIR score and the rMETRIQ score (Chan et al., 2019). Conversely, our current scoping review discovered no usage of FOAM or FOAN in continuing nursing education. Several papers, however, discussed the growing community of smaller social media networks dedicated to medical and nursing education without explicitly utilizing FOAM or FOAN terminologies (Moorley & Chinn, 2015; Pilcher & Harper, 2016; Wilson et al., 2014). This might parallel the start of FOAM in the emergency medicine literature: adopted first by a small number of FOAM practitioners before becoming formalized and legitimized by organizations and end users (Chan et al., 2020).

Given the growing field of social media and FOAM research in emergency medicine, a similar growth could exist within emergency nursing. However, further understanding is required on why nurses are not currently engaging in FOAM and FOAN resources. By far, more papers specifically targeting emergency nursing, or a collaboration between emergency nursing and medicine, are required. The vast majority of papers in the current scoping review are from the general nursing perspective and while there is significant overlap in the scope of both emergency and general nursing, the nuances of emergency nursing specific competencies may possess interesting implications for social media education. This may include more descriptive studies of the emergency nurse that would be useful in gaining insight in how social media is used or can be used in that population. Finally, more justification and clarification studies are needed to help strengthen the evidence that social media can be a viable continuing education approach.

## Limitations

As the body of literature is growing and the terminologies relevant to social media are not standardized, citations may have been missed or excluded during the literature search. Attempts to mitigate this include having a medical librarian peer-review the search, reviewing other similar reviews on social media for appropriate search terms to use, corroborating our database search with Google Scholar, and ensuring a high inter-rater reliability $\kappa$ during the initial screening process. In order to include as many papers as possible, no assessment of quality was performed. However, as this scoping review was conducted to determine the breadth of knowledge regarding social media and FOAM in emergency nursing, the lack of a formal quality assessment was deemed appropriate.

## Conclusion

The discussion of social media in the emergency and general nursing literature is growing, but is currently superficial and sparse. Despite a parallel growth of FOAM in emergency medicine literature, there was no discussion on the topic within the nursing literature. Although usage of social media as an educational activity was largely positive, more studies are needed to see the effects of social media on knowledge acquisition. The current literature is generally favourable of social media being used for educational purposes and so we hope that future research can look into the barriers to adopt FOAM, FOAN, and social media in continuing education.

## Implications for emergency nursing practice

1. Emergency nurses are expected to be up to date with the knowledge and skills they use in their practice.
2. Social media and Free Open Access Medicine/Nursing education (FOAM/FOAN) are a viable option for many emergency department nurses as there are little barriers to access and encompass a wide range of topics.
3. Despite a growing amount of research amongst the use of social media in emergency medicine, there is a lack of research in emergency nursing and more studies are required to determine the effects of social media in knowledge acquisition and the best ways to use social media for continuing education amongst emergency nurses.

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# Timing of trauma team involvement and the impact on the length of stay and time to definitive care in the emergency department: A retrospective administrative data and chart review

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## Abstract

**Background:** For patients sustaining major trauma, decreasing time to definitive care remains a primary goal. Specialized trauma team involvement is essential for coordinating the emergency department care of complex major trauma patients. The aim of this study was to evaluate if the timing of trauma team involvement impacts the length of stay and time to definitive care in the emergency department.

**Methods:** This is a single-centre retrospective medical record review, including patients meeting Quebec pre-hospital triage criteria for major trauma from May 15, 2018, to December 31, 2020. We assessed the time from patient arrival until departure from the resuscitation room, time to CT scan, time to disposition, and overall length of emergency department stay. Patients were grouped according to the timing of trauma team activation (TTA) as (1) pre-hospital notification, (2) on arrival in the emergency department, (3) receiving a trauma consult only, or (4) no trauma team involvement. Mean times and standard deviations were calculated, and group differences were assessed using the Kruskal-Wallis test and the independent sample Mann-Whitney U test.

**Results:** We identified 371 patients meeting our inclusion criteria; there were no differences between groups in mean time spent in the resuscitation room based on the timing of trauma team involvement (45–51 minutes, $p = 0.422$). A trauma team activation with pre-hospital notification was associated with a statistically significant shorter time to CT scan (62–81 minutes, $p = 0.010$), time to disposition (6:37–13:41, $p < 0.001$), and total emergency department length of stay (9:22–23:16 hours:minutes, $p < 0.001$).

**Conclusion:** Appropriate trauma team activation improves performance indicators used to evaluate the quality of care in the emergency department. This research suggests that pre-hospital trauma team activation should be considered the standard of care for all patients meeting pre-hospital field triage criteria for major trauma.

*Keywords:* trauma, triage, pre-hospital, trauma team activation, trauma quality indicators

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To decrease morbidity and mortality, trauma systems must provide timely and appropriate care to those sustaining life-threatening injuries. Trauma care is provided on a continuum from pre-hospital, the emergency department and other in-hospital services to post-hospital care, including rehabilitation (Lorthios-Guilledroit, 2020). When critically injured patients do not receive the appropriate care, death may occur within hours of injury, primarily from uncontrolled hemorrhage and brain injury (Wandling & Cotton, 2020). Appropriate resource utilization depends on accurate trauma triage in the pre-hospital and in-hospital settings. Accurate triage ensures that a multidisciplinary trauma team assesses patients with life-threatening injuries, allowing for rapid diagnosis and treatment (Jelinek et al., 2014). While many debate specific strategies to provide optimal trauma care, the goal of all trauma systems remains the same, to decrease patient morbidity and mortality.

Field triage guidelines, including the Quebec pre-hospital trauma triage scale "Echelle Quebecois de Triage Pre-Hospitalier de Trauma" (EQTPT) and the Centers for Disease Control – American College of Surgeons Committee on Trauma (CDC-ACSCOT) Guidelines for Field Triage of Injured Patients (Frieden, 2012), assist pre-hospital personnel in identifying trauma patients for transport to the appropriate hospital that can provide the level of trauma care required for the patient. These tools also assist pre-hospital personnel in providing necessary information to emergency department personnel to establish the need for trauma team activation (TTA) before the patient's arrival. TTA with the pre-hospital notification is dependent on the accuracy of information provided by pre-hospital personnel (McCullough et al., 2014). To determine which patients are appropriate for TTA, trauma centres use physiological criteria (e.g., systolic blood pressure, respiratory status, Glasgow Coma Scale) to identify patients likely to have severe injuries associated with increased morbidity and mortality (Tignanelli et al., 2018). In contrast, field triage guidelines, such as the EQTPT (Echelle quebecoise de triage prehospitalier en traumatologie, 2016), are not only based on physiological criteria but also high-risk mechanisms of injury.

In the province of Quebec, pre-hospital services implemented the EQTPT pre-hospital triage tool (adapted from the CDC-ACSCOT Guidelines for Field Triage of Injured Patients) on May 15, 2018 (gouvernement du Québec et al., 2016). These triage tools classify trauma patients based on physiological criteria and mechanism of injury to rank them from level 1 (highest) to level 5. Trauma patients in Quebec ranked levels 1–3 are transported ≤60 minutes by ground ambulance (air transport is not available in the province of Quebec) directly to a Level 1 trauma centre. Pre-hospital care is predominantly provided by primary care paramedics who focus on providing basic life support (BLS) while providing rapid transport to the emergency department. Unlike advanced care paramedics authorized to perform procedures such as endotracheal intubation and administer intravenous medications, BLS paramedics use non-invasive techniques and provide basic monitoring and care during transport (Yoder et al., 2020).

Process indicators used when evaluating the quality of care and performance of trauma centres in the province of Quebec include (1) a length of stay in the emergency department of <4 hours for major trauma patients, (2) appropriate under- and over-triage/TTA rates, (3) airway management in the emergency department, and (4) stabilizing of hemorrhagic pelvic fractures within ≤3 hours of arrival in the emergency department (Lorthios-Guilledroit, 2020). Accuracy in TTA is pivotal in providing safe, systematic trauma patient care (Schwing et al., 2019). We hypothesize that patients who meet field triage criteria for major trauma, such as those who met EQTPT levels 1–3 criteria, would benefit from the timely involvement of the trauma team in their care upon arrival to the emergency department of a Level I trauma centre. This study aimed to evaluate if the timing of trauma team involvement impacts the length of stay and time to definitive care in the emergency department.

## Methods

### Study design

This was a single-site retrospective cross-sectional descriptive study utilizing retrospective administrative and electronic medical records. We included patients aged ≥16 years who sustained a traumatic injury and met the EQTPT pre-hospital triage criteria to bypass community hospitals and be transported directly to a Level 1 trauma centre between May 15, 2018, and December 31, 2020.

### Setting

This study was conducted in a Level 1 trauma centre in the province of Quebec, Canada. A level 1 trauma centre is the highest level of trauma care providing specialized trauma care within a trauma system, typically at a university-affiliated teaching institution (Tallon, 2011). This level 1 trauma centre has a catchment population of 2.9 million people, serving approximately 10,000 trauma patients per year, with 1,600 being major trauma patients. The trauma centre services the southern half of the island of Montreal, the greater Montreal south shore (Monteregie) region, and northern Quebec. In this centre, trauma teams include a trauma team leader (emergency department physician, surgeon, or anesthetist), a trauma surgeon, trauma residents, registered nurses, respiratory therapists, and patient care attendants. The emergency department physician may choose to activate the trauma team at the time of pre-hospital notification of an incoming trauma or decide to first assess the patient themselves and determine whether the patient meets TTA or trauma consult (partial team called on a non-emergent basis) criteria after their evaluation.

### Data sources and sample

Data were collected from the electronic medical files and the local trauma registry. A de-identified list of primary ambulance transports initiated from the Monteregie region between January 1, 2018, and December 31, 2020, were received from the local health authority (Centre intégré de santé et de services sociaux [CISSS] Montérégie-Centre). This list included transport dates and times along with transport codes. We excluded non-urgent transports, defined as patients with an EQTPT level >3, as these patients would not require high-priority transportation. We also excluded those patients transported before the official implementation of the EQTPT protocol. From this list, emergency department arrival times were searched identifying patients meeting our inclusion criteria – all major trauma patients (EQTPT levels 1, 2, and 3) aged ≥16 years who originated in the Monteregie region and bypassed community hospitals to be transported directly to the Level 1 trauma centre. We subsequently excluded those in

which the timing of the TTA could not be determined and those with any individual missing data points from statistical analysis. The primary researcher did the initial data collection. Two trained reviewers conducted a secondary review of 25% of the charts to ensure accuracy in data collection.

**Data collection and analysis**

A standardized data collection form was created and used to document patient demographics, pre-hospital transport times, mechanism of injury, pre-hospital triage level, triage criteria met, final disposition, along with time spent in the resuscitation room, time from arrival to CT scan, time until disposition decision, and total length of stay in the emergency department. These data were then inputted into an Excel spreadsheet, and a second trained reviewer verified 25% of the medical records to ensure accuracy (Kaji et al., 2014). We classified and grouped subjects by the timing of TTA as (1) no trauma team involvement, (2) TTA after arrival in the emergency department, (3) TTA with pre-hospital notification, (4) receiving a trauma consult only.

Descriptive statistics were used to assess patient characteristics and other quality indicators selected for analysis, including time spent in the resuscitation room, time from arrival until CT scan, length of time from arrival to decision of the final disposition, and total length of stay in the emergency department(Lorthios-Guilledroit, 2020). Continuous variables are presented as means with standard deviations and categorical variables as counts and percentages. TTA subgroups were compared using the Kruskal-Wallis test and 95% confidence intervals were calculated. We considered p values <0.05 as statistically significant. Nonparametric statistical tests were selected due to non-normal data distributions with a negative skew, despite data cleaning. We used SPSS version 28 for statistical analysis.

A priori, we planned to separate the sample and conduct the same analysis, including only those subjects who met EQTPT level 1 criteria (GCS <14 or SBP <90, RR <10 or RR >29, or requiring ventilation), as this group would represent the most severely injured with the least variability in the patient population. We chose to analyze this group separately to decrease the impact of less severely injured patients in the EQTPT levels 2 and 3 groups from impacting the level of urgency that the trauma team felt in the treatment of the patients that could potentially impact the times spent in the ED. The same quality indicators were compared for those meeting EQTPT level 1 criteria and had a 1) TTA with pre-hospital notification or 2) TTA after arrival in the emergency department. These groups were compared using the independent samples Mann-Whitney U test using a 95% confidence interval with p <0.05 considered statistically significant.

We calculated the starting time point as the time point recorded on pre-hospital documents for arrival to the emergency department site to avoid time discrepancies associated with any delays from arrival to triage from emergency department personnel. Time in the resuscitation room was determined from documentation in nursing notes of the patient leaving the resuscitation room or from the timestamp of the patient's location change in the electronic medical record. The time for CT scan was determined from the automatic timestamp for the first CT scan in the electronic medical record. Time of disposition was determined by the automatic timestamp applied when the request for admission, transfer, or discharge was registered in the electronic medical record. The total length of stay was determined by departure time recorded in the electronic medical record. For those who died in the emergency department, disposition time, and end of the length of stay were recorded as the time of death. Ethical approval was obtained by the The Athabasca University Research Ethics Board (REB) (24272) and the McGill University Health Center Research Ethics Board (2021-7693).

## Results

During the study period, 2,148 patients were transported directly to the Level 1 trauma centre from the Monteregie region, of which 477 were high-priority transports. Of these, 14 patients were excluded for being from transports that occurred before the implementation of the trauma triage protocol. A total of 371 individual patients were found to meet inclusion criteria and were reviewed; 33 patients were subsequently excluded from statistical analysis as the timing of TTA was undetermined. Sample characteristics are depicted in Table 1. Subjects were primarily male (70.1%) with a mean age of 47 years (range 16–96). Motor vehicle crashes ($n$ = 185, 49.9%) were the primary source of injury followed by falls ($n$ = 91, 24.5%), and penetrating trauma ($n$ = 41, 11.1%).

TTA was done for 63.3% ($n$ = 214) of patients; of these 121 patients had pre-hospital notification (35.8%), 60 patients had a TTA after arrival in the emergency department (17.8%), 33 (8.9%) of the patients who had a TTA were missing documentation of the timing of the TTA, and 68 patients (20.1%) had a trauma consult without a TTA. There were 89 patients (26.3%) who did not have any involvement with the trauma team, either through a TTA or trauma consult, during their stay in the emergency department. Those who did not have trauma team involvement were used as a comparison group to evaluate the impact of the involvement of the trauma team on the different quality indicators. A total of 241 patients (65%) met EQTPT level 1 criteria, while 114 patients (30.7%) met level 2 criteria and 16 (4.3%) met level 3 criteria.

Mean times in the resuscitation room ranged from 0:45–0:51 minutes ($p$ = 0.147), while mean time to CT scan ranged from 1:02–1:21 minutes ($p$ = 0.023). Mean times from arrival to disposition were statistically significant and ranged from 6:37–13:41 minutes ($p$ < 0.001) and mean total length of stay ranged from 9:22–23:16 minutes ($p$ < 0.001). Mean times in all categories were found to be shortest for those who had a full TTA with pre-hospital notification and longest for those who had a trauma consult without TTA. Mean time intervals are represented in Table 2.

For those patients meeting EQTPT level 1 field triage criteria, when the trauma team was activated with pre-hospital notification, as compared to activation on arrival in the emergency department, there were statistically significant decreases in mean time spent in the resuscitation room (0:49 to 0:44 minutes, $p$ = 0.039) and mean time to CT scan (1:11 to 1:00 minutes, $p$ = 0.005). While not statistically significant, time to disposition increased from 5:07 to 6:29 minutes ($p$ = 0.912), and the total length of stay increased from 7:23 to 8:35 minutes ($p$ = 0.654). This data is represented in Table 3.

**Table 1**

*Sample Characteristics*

| | Total *n* (%) | TTA PH notification *n* (%) | TTA after arrival *n* (%) | Trauma consult alone *n* (%) | No trauma team *n* (%) |
|---|---|---|---|---|---|
| Total | 338 (100) | 121 (35.8) | 60 (17.8) | 68 (20.1) | 89 (26.3) |
| Sex | | | | | |
| Male | 260 (70.1) | 89 (37.7) | 45 (19.1) | 46 (19.5) | 56 (23.7) |
| Female | 111 (29.9) | 32 (32.4) | 15 (14.7) | 22 (21.6) | 33 (32.4) |
| Age Category (years) | | | | | |
| 16–34 | 124 (36.7) | 48 (38.7) | 25 (20.2) | 22 (17.7) | 29 (23.4) |
| 35–54 | 100 (29.6) | 37 (37.0) | 14 (14.0) | 24 (24.0) | 25 (25.0) |
| 55–74 | 73 (21.6) | 24 (32.9) | 13 (17.8) | 13 (17.8) | 23 (29.3) |
| 75+ | 42 (12.1) | 12 (29.3) | 8 (19.5) | 9 (22.0) | 12 (29.3) |
| Mean age (SD) | 46.6 (20.7) | 45.8 (20.1) | 45.7 (20.8) | 46.4 (20.1) | 48.9 (22.5) |
| Age range (years) | 16–96 | 16–96 | 17–91 | 16–93 | 17–96 |
| Mechanism of Injury | | | | | |
| Motor vehicle crash | 168 (49.7) | 72 (42.9) | 33 (19.6) | 36 (21.4) | 27 (16.1) |
| Fall | 90 (26.6) | 19 (21.1) | 16 (17.8) | 20 (22.2) | 35 (38.9) |
| Penetrating | 33 (9.8) | 20 (60.6) | 4 (12.1) | 3 (9.1) | 6 (18.2) |
| Pedestrian | 10 (3.0) | 3 (30.0) | 3 (30.0) | 0 (0) | 4 (40.0) |
| Cyclist | 13 (3.8) | 4 (30.8) | 2 (15.4) | 5 (38.4) | 2 (15.4) |
| Crush | 13 (3.5) | 2 (15.4) | 2 (15.4) | 1 (7.7) | 8 (61.5) |
| Assault | 9 (2.7) | 0 (0) | 0 (0) | 3 (33.3) | 6 (66.7) |
| Other | 2 (0.6) | 1 (50.0) | 0 (0) | 0 (0) | 1 (50.0) |

*Note*. TTA = trauma team activation; SD = standard deviation

No significant difference in sex for timing of TTA using the chi-square test, statistical significance level $p < 0.05$.

Distribution of age is the same across categories using the Independent-Samples Kruskal Wallis test, statistical significance level $p < 0.05$.

## Discussion

In this single-site retrospective review of administrative data including 371 individual patients, we found that the time to CT scan was shorter when a full TTA was done. Patients who had a TTA with pre-hospital notification were found to have the fastest time from arrival to CT scan. The time from arrival to disposition decision and total length of stay was the shortest for those with a full TTA. Time spent in the resuscitation room did not vary significantly among groups. When directly comparing those who had a pre-hospital TTA to those who had a TTA after arrival in the emergency department, time spent in resuscitation, time to disposition, and length of stay did not vary significantly. However, the time from arrival until CT scan was found to be shorter when TTA was done before the emergency department arrival of the patient. Past studies found that early TTA was associated with a decrease in the time to definitive care (Yoo & Mun, 2014) and that the trauma team arriving prior to the arrival of the patient allowed for better coordination of the team and the resources, decreasing the time to definitive care and a decreased length of stay in the emergency department(Polovitch et al., 2019). While the groups who had a TTA had shorter times noted on all time points when compared to those who did not have a TTA, the only timepoint that had a statistically significant improvement with pre-hospital TTA compared to a TTA after the arrival of the patient was the time from arrival to CT scan.

Reasons for under-triage and poor TTA compliance have been reported and primarily attributed to subjective TTA criteria, different triage rates based on professional experience, unclear roles and responsibilities of the trauma team, and the emergency

**Table 2**

*Emergency Department Times and Timing of Trauma Team Involvement*

| Timing in Relation to TTA | | Total *n* (%) | Mean time minutes (SD) | *p* value* |
|---|---|---|---|---|
| Time in resuscitation room | No TTA | 81 (21.6) | 0:45 (0:28) | 0.147 |
| | TTA after arrival | 53 (14.2) | 0:49 (0:26) | |
| | TTA pre-hospital notification | 107 (28.8) | 0:45 (0:27) | |
| | Trauma consult only | 60 (16.2) | 0:51 (0:32) | |
| | Total | 301 | 0:47 (0:28) | |
| | Missing | 70 (18.9) | | |
| Time from arrival to CT scan | No TTA | 83 (22.3) | 1:17 (0:52) | 0.023 |
| | TTA after arrival | 55 (14.8) | 1:10 (0:32) | |
| | TTA pre-hospital notification | 103 (27.8) | 1:02 (0:25) | |
| | Trauma consult only | 66 (17.8) | 1:21 (0:43) | |
| | Total | 307 | 1:11 (0:40) | |
| | Missing | 64 (17.2) | | |
| Time from arrival to disposition | No TTA | 88 (23.7) | 9:28 (7:35) | <0.001 |
| | TTA after arrival | 59 (15.9) | 6:49 (7:33) | |
| | TTA pre-hospital notification | 120 (32.3) | 6:37 (8:40) | |
| | Trauma consult only | 67 (18.1) | 13:41 (15:58) | |
| | Total | 334 | 8:49 (10:28) | |
| | Missing | 35 (9.4) | | |
| Total length of stay in emergency department | No TTA | 87 (23.5) | 12:37 (12:19) | <0.001 |
| | TTA after arrival | 60 (16.2) | 10:36 (17:26) | |
| | TTA pre-hospital notification | 120 (32.3) | 9:22 (13:51) | |
| | Trauma consult only | 68 (18.3) | 23:16 (23:53) | |
| | Total | 335 | 14:16 (18:05) | |
| | Missing | 36 (9.7) | | |

*Note*. TTA = trauma team activation; PH = pre-hospital; SD = standard deviation
*Independent-Samples Kruskal-Wallis test, statistical significance level $p < 0.05$

department physicians feeling comfortable managing the injuries without the trauma team(Verhoeff et al., 2019). It was speculated that there was a hesitancy to launch a TTA before arrival to the emergency department using only information acquired from the pre-hospital notification due to the assumption that the trauma team could be quickly involved after the initial assessment if required, along with a perception that the patient would spend longer in the resuscitation room if the trauma team were called to assess the patient and would have a longer length of stay in the emergency department. As the emergency department physician is responsible for supervising the trauma team members until the trauma team leader arrives in the emergency department, decreasing the time that the emergency department physician spends in the resuscitation room is of interest, as it allows for more time to manage other patients in the emergency department. In a crowded emergency department, significant time in the resuscitation room with one patient impacts patient flow within all areas of the department. Citizens utilizing the emergency department have a right to access timely assessment and management of their care (Agency for Healthcare Research and Quality, 2022).

The six domains of healthcare quality described by the Institute of Medicine aim to provide safe, effective, patient-centred, timely, efficient and equitable care(Six Domains of Health

**Table 3**

*Emergency Department Quality Indicators for EQTPT Level 1 Traumas and Timing of Trauma Team Activation*

| Timing in Relation to TTA | | *n* (%) | Mean time minutes (SD)** | *p* value* |
|---|---|---|---|---|
| Time in resuscitation room | TTA after arrival | 33 (25.0) | 0:49 (0:19) | 0.374 |
| | TTA pre-hospital notification | 81 (61.4) | 0:44 (0:29) | |
| | Missing | 18 | | |
| Time to CT scan | TTA after arrival | 36 (27.3) | 1:11 (0:27) | 0.022 |
| | TTA pre-hospital notification | 80 (60.6) | 1:00 (0:22) | |
| | Missing | 16 | | |
| Time from arrival to disposition | TTA after arrival | 38 (28.8) | 5:07 (6:31) | 0.400 |
| | TTA pre-hospital notification | 92 (69.7) | 6:29 (9:05) | |
| | Missing | 2 | | |
| Total length of stay in ED | TTA after arrival | 39 (29.5) | 7:23 (12:58) | 0.620 |
| | TTA pre-hospital notification | 92 (69.7) | 8:35 (12:19) | |
| | Missing | 1 | | |

*Note*. TTA = trauma team activation; ED = emergency department

*Independent samples Mann-Whitney U test, statistical significance level $p < 0.05$

** time presented as hours:minutes

Care Quality, 2018). Assuring timely care involves monitoring the time it takes for clinicians to assess a patient. Patients requiring admission ought to be promptly moved to inpatient units, thereby reducing the total length of stay in the emergency department (Hansen, 2019). Involving the trauma team allows the specialized team to focus on the care of the major trauma patient and allows the emergency department physician to focus on the other patients under their care. The American College of Surgeons requires the trauma team leader to be present in the emergency department within 15 minutes of the patient's arrival (Schwing et al., 2019). By activating the trauma team based on information provided in the pre-hospital notification, which in the trauma centre studied is frequently more than 10 minutes before the arrival of the patient to the emergency department, the trauma team leader has adequate time to arrive before the patient arrival thus liberating the emergency department physician to provide other care. Fundamental priorities in emergency medicine include access to critical care when the patient's condition requires and early access to care from specialists(Hansen, 2019). When the trauma team is activated pre-hospital and involved upon patient arrival in the emergency department, the trauma team can efficiently organize and evaluate all aspects of care (i.e., specialist referral) as required.

Timely care also involves access to services for those with conditions requiring immediate interventions and treatment requires appropriate access to diagnostic services in the emergency department (Hansen, 2019). Access to CT scan for the trauma patient is a rate-limiting step for those not profoundly hemodynamically unstable and requiring immediate surgery. TTA gives the patient priority access to CT scans, allowing the trauma team to diagnose injuries requiring urgent intervention rapidly. The benchmark goal for Quebec emergency departments is to have a head CT scan, for patients with evidence of traumatic brain injury, within one hour of arrival in the emergency department (Lorthios-Guilledroit, 2020). In a recent study, a CT scan of the head done within the first hour after arrival was defined as an "immediate" CT head, and a CT of the head done within one to six hours was considered "delayed." Those who had an immediate CT of the head were found to have shorter times to interventions, such as a craniotomy or intracranial pressure monitor insertion, and shorter lengths of stay in the emergency department (Schellenberg et al., 2021). Identifying solid organ injury on CT scan is essential to establish the need for angioembolization. Delays to angioembolization for those patients with solid organ injury have been found to have an increase in 24-hour mortality rates (Chehab et al., 2020). For patients with pelvic fractures requiring angioembolization, longer times to treatment also were associated with increased in-hospital mortality, with rates rising for each hour of delay (Matsushima et al., 2018). The length of time from arrival until CT scan ranged from 0:14 minutes to 5:35 hours. The mean time for all groups was >1 hour, with the shortest mean time being 1:02 hours for the group with a pre-hospital TTA. The coordinated care from the entire trauma team being present from the arrival of

the patient, combined with the CT scan being reserved for major trauma patients once a TTA is called, aids in decreasing the time from arrival until CT scan.

Multiple process indicators in use for quality of care evaluation are based on maximum delays from arrival to interventions, including the length of stay in the emergency department of <4 hours and stabilizing pelvic fractures within 3 hours of arrival in the emergency department (Lorthios-Guilledroit, 2020). Many reasons could be attributed to the significant increase in length of stay for those who had a trauma consult without a TTA. These patients are typically not as acutely injured but still may have substantial injuries. They do not usually require emergent surgery or intervention but require additional care. Those who have no injuries requiring a trauma team consult can be discharged home more quickly, leaving the patients who had a trauma team consult needing more time to establish a care plan.

**Limitations**

As with most retrospective studies, the accuracy of information gathered is dependent on the accuracy of the information available in the medical records. Incomplete documentation resulted in the inability to establish the timing of trauma team involvement for a portion of the charts reviewed. As most chart data are in narrative form, data collected from documentation pertinent to this study may be subject to interpretation by the reviewer. Conflicting times in the resuscitation room were noted between the documented times in nursing notes and timestamps in electronic medical records. When the time was recorded in nursing notes, this time was selected for use in the analysis. Being that this was a single-site study, a larger, multi-site study would be needed to confirm and generalize the findings.

## Conclusion

When trauma team care is required, early involvement of the trauma team through pre-hospital TTA significantly decreases time to CT scan, time spent in the emergency department without a disposition, and overall emergency department length of stay. Early TTA improves performance indicators used to evaluate the quality of care in the emergency department. This research suggests that when minutes count, pre-hospital TTA should be considered the standard of care for all major trauma patients meeting TTA criteria.

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# ENC(C) Review Questions

**Heather McLellan and Margaret Dymond**

**Question 1**

1. You are caring for a patient who is suspected of having sustained carbon monoxide (CO) poisoning from a furnace malfunction in their trailer. They were initially confused and had difficulty focusing on conversation. After administration of high flow oxygen, they are responding appropriately and complaining of nausea and headache. Their carboxyhemoglobin level (COHb) is 13%. Which of the following statements are true with regard to this patient care scenario?
   A. CO poisoning can result in a rebound deterioration within hours to days after exposure
   B. It is unlikely to be CO exposure as they do not recover with oxygen alone
   C. Hyperbaric oxygen therapy is required for definitive CO management in all exposures
   D. Carboxyhemoglobin (COHb) is a poor indicator of toxicity with CO exposure.

**Question 2**

2. An 18-year-old patient is escorted into the emergency department by family. They are incoherent with rambling speech and unable to walk unassisted. The family believes they have been "depressed lately" and thinks they have overdosed on "something." Their vital signs (VS) and clinical presentation are as follows:
   - B/P 110/80 mmHg
   - HR 110 beats per minute (bpm)
   - RR 24 breaths per minute
   - Temp 38°C (oral)
   - GCS 11/15
   - Pupils 6 mm/reactive
   - Dry skin, mucous membranes

   Based on their VS and clinical presentation, the ED nurse suspects which toxidrome?
   A. Opioid overdose
   B. Anticholinergic overdose
   C. Sympathomimetic overdose
   D. Acetaminophen overdose

**Question 3**

3. For the patient in the previous scenario, a priority intervention for this patient would be which of the following?
   A. Find the antidote
   B. Insert one IV and give fluids at 50mLs/hr
   C. Insert a nasogastric tube for gastric lavage
   D. Prepare for possible intubation

**Question 4**

4. A 22-year-old patient has ingested the vaping liquid from several vaping pens containing nicotine. Their vital signs (VS) and clinical presentation are as follows:
   - B/P 184/115 mmHg
   - HR 144 beats per minute (bpm)
   - RR-24 breaths per minute
   - Temp 37°C (temporal artery)
   - SpO2 – 93% on room air
   - GCS 10/15
   - Copious oral secretions, vomiting, and diarrhea

   The highest priority intervention would be which of the following?
   A. Administering a benzodiazepine
   B. Prepare to manage the airway
   C. Administering a fluid bolus
   D. This is a cholinergic syndrome – administer Atropine

**Question 5**

5. A patient arrives in your ED after collapsing while running a marathon. Race organizers sent information that the individual pre-hydrated with several litres of water as well as ingesting water at every aid station. The patient is confused and complains of dizziness, nausea and a severe (8/10) headache. This situation is consistent with which of the following mechanisms?
   A. Prolonged QT syndrome
   B. Gastroenteritis
   C. Hypoglycemia
   D. Exercise associated hyponatremia

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## Answers:

**Question 1**

Correct answer: A

Manaker & Perry (2023) note that CO is eliminated via pulmonary circulation with administration of oxygen. This begins immediately on removal from the exposure. A rebound effect is attributed to a lat release of CO from myoglobin allowing it to reattach to hemoglobin (Tuna et al., 2014). Hyperbaric oxygen therapy is recommended for COHb >25% (?15% for pregnant patients), loss of consciousness, severe metabolic acidosis or end organ ischemia (Manaker & Perry, 2023). Normal COHb levels are <5% and levels of 25% indicate a significant exposure (Manaker & Perry, 2023; Tuna et al., 2014).

**Question 2**

The correct answer is B.

The clinical picture may be unclear regarding what/when/why in explaining the patient's clinical presentation. Toxidromes may share similar signs and symptoms, thus a definitive toxidrome is not always apparent (Levine, 2023). Opiate overdose typically will present with small pinpoint pupils and respiratory depression; sympathomimetic presentations typically have hypertension/tachycardia; and acetaminophen ingestions typically may have normal VS and abdominal pain due to GI/liver involvement. This presentation is typical of anticholinergic syndrome with increased VS parameters and mumbling speech (Levine, 2023; Mark & Goldman, 2023). If the overdose picture is confusing, consider polypharmacy ingestion (multiple drugs; Levine, 2023).

**Question 3**

Correct answer D

The patient's GCS is 11 and likely will deteriorate so preparing for a definitive airway is high on the list of priority interventions (Levine, 2023, Mark & Goldman, 2023). The type/amount/and when the ingestion took place is unknown. Gastric lavage is not recommended nor is fluid bolus unless the VS are clinically unstable. Finding antidotes needs further assessment of history. The ABC's approach takes priority over finding antidotes (Levine, 2023).

**Question 4**

Correct answer B

Rationale:

Severe nicotine intoxication can result in respiratory and cardiovascular collapse (Barbuto, 2023; Henstra, 2022). The patient may exhibit cholinergic symptoms initially such as increased oral secretions, nausea, vomiting, diarrhea, elevation in blood pressure causing hypertension and tachycardia. The later stage of severe nicotine toxicity includes a rapid progression to organ failure and can be lethal. Lethargy, seizures, and coma can follow early-stage symptoms. Muscle weakness, poor muscle tone can result respiratory paralysis.

The priority for patient care starts with assessment in the primary survey (Levine, 2023). Airway and breathing need to be secured due to the potential rapid deterioration of the patient's clinical condition. A benzodiazepine may be reasonable to administer for sedation and if seizures occur.

**Questions 5**

Correct answer D

Exercise associated hyponatremia is a situation where there is increased total body free water relative to total body sodium. The primary mechanism is increased intake of hypotonic fluids although breakdown of glycogen during exercise (Rosner & Hew-Butler, 2023) is another source as is SIADH from physical exertion (Buck et al, 2023). The scenario gives us the information that the individual ingested a significant amount of water prior to and during the race prior to collapse. There is insufficient information to identify hypoglycemia which is frequently associated with alterations to LOC, gastroenteritis which might be associated with the nausea and vomiting, or prolonged QT syndrome which might be indicated with the sensation of dizziness. Hyponatremia results in an osmotic gradient that causes free water to move from the vascular bed to brain and lung, causing cerebral edema and altered LOC (Buck et al., 2023).

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# Questions de révision pour la CSU(C)

**Heather McLellan et Margaret Dymond**

**Question 1**

1. Vous vous occupez d'un patient que l'on soupçonne d'avoir été empoisonné au monoxyde de carbone (CO) à la suite d'un dysfonctionnement de la fournaise de sa caravane. Il était confus au début et avait du mal à se concentrer sur la conversation. Après l'administration d'oxygène à haut débit, ils répondent normalement et se plaignent de nausées et de maux de tête. Leur taux de carboxyhémoglobine (COHb) est de 13 %. Parmi les affirmations suivantes, lesquelles sont vraies en ce qui concerne ce scénario de soins au patient ?
   A. L'intoxication au CO peut entraîner une détérioration continue dans les heures ou les jours qui suivent l'exposition
   B. Cela ne correspond probablement pas à une exposition au CO, car ils ne se rétablissent pas avec de l'oxygène seul
   C. L'oxygénothérapie hyperbare est nécessaire pour la prise en charge définitive du CO dans toutes les expositions
   D. La carboxyhémoglobine (COHb) est un mauvais indicateur de la toxicité de l'exposition au CO

**Question 2**

2. Un patient de 18 ans arrive au service des urgences accompagné de sa famille. Il est incohérent, parle de façon décousue et est incapable de marcher sans aide. La famille pense qu'il est « déprimé ces temps-ci » et qu'il a fait une overdose d'une « substance quelconque ». Les signes vitaux (SV) et la présentation clinique sont les suivants :
   - TA 110/80 mmHg
   - FC 110 battements par minute (bpm)
   - FR 24 respirations par minute
   - Température 38°C (orale)
   - GCS 11/15
   - Pupilles 6 mm/réactives
   - Peau et muqueuses sèches

   Selon leur SV et leur présentation clinique, l'infirmière du service des urgences suspecte la présence de l'un des toxidromes suivants ?
   A. Surdose d'opioïdes
   B. Surdose d'agents anticholinergiques
   C. Surdose de sympathomimétiques
   D. Surdose d'acétaminophène

**Question 3**

3. Parmi les interventions pour le patient du scénario précédent, laquelle serait prioritaire ?
   A. Trouver l'antidote
   B. Poser une perfusion et administrer des fluides à raison de 50 ml/h
   C. Poser une sonde naso-gastrique pour effectuer un lavage gastrique
   D. Prévoir une éventuelle intubation

**Question 4**

4. Un patient de 22 ans a ingéré le liquide de vapotage de plusieurs stylos de vapotage contenant de la nicotine. Ses signes vitaux (SV) et sa présentation clinique sont les suivants :
   - TA 184/115 mmHg
   - FC 144 battements par minute (bpm)
   - FR-24 respirations par minute
   - Température 37°C (artère temporale)
   - SpO2 — 93 % à l'air ambiant
   - GCS 10/15
   - Sécrétions orales abondantes, vomissements et diarrhée

   Quelle serait la priorité de l'intervention ?
   A. Administration de benzodiazépines
   B. Être prêt à gérer les voies respiratoires
   C. Administration d'un bolus de liquide
   D. Il s'agit d'un syndrome cholinergique — administrer de l'Atropine

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**Question 5**

5. Un patient est admis dans votre service d'urgence après s'être effondré lors d'un marathon. Les organisateurs de la course ont envoyé des informations indiquant que la personne s'était préalablement hydratée avec plusieurs litres d'eau et qu'elle avait ingéré de l'eau à chaque poste de ravitaillement. Le patient est confus et se plaint de vertiges, de nausées et d'un mal de tête intense (8/10). Parmi les mécanismes suivants, lequel correspond à cette situation ?
   A. Syndrome du QT long
   B. Gastroentérite
   C. Hypoglycémie
   D. Hyponatrémie associée à l'exercice

## Réponses :

**Question 1**

Réponse : A

Selon Manaker & Perry (2023), le CO est éliminé par la circulation pulmonaire sous l'effet de l'administration d'oxygène. Cette élimination commence immédiatement après le retrait de l'exposition. Un effet de rebond est attribué à une libération tardive du CO de la myoglobine lui permettant de se rattacher à l'hémoglobine (Tuna et coll., 2014). L'oxygénothérapie hyperbare est recommandée en cas de COHb >25 % (? 15 % pour les patientes enceintes), de perte de conscience, d'acidose métabolique sévère ou d'ischémie des organes terminaux (Manaker et Perry, 2023). Les taux normaux de COHb sont inférieurs à 5 %. Des taux de 25 % indiquent une exposition importante (Manaker et Perry, 2023 ; Tuna et coll., 2014).

**Question 2**

Réponse : B.

Le tableau clinique peut être ambigu en ce qui concerne le quoi/quand/pourquoi dans l'explication de la présentation clinique du patient. Les toxidromes peuvent présenter des signes et des symptômes semblables, de sorte qu'il n'est pas toujours possible de déterminer un toxidrome définitif (Levine, 2023). En général, les surdoses d'opiacés se manifestent par de petites pupilles en pointe et une dépression respiratoire ; les surdoses de sympathomimétiques se manifestent par une hypertension et une tachycardie ; les surdoses d'acétaminophène se manifestent par des SV normaux et des douleurs abdominales dues à une atteinte de l'appareil digestif ou du foie. Cette présentation est typique du syndrome anticholinergique avec des paramètres de SV accrus et un discours marmonné (Levine, 2023 ; Mark et Goldman, 2023). Si le tableau du surdosage porte à confusion, il faut envisager l'ingestion de polypharmacie (plusieurs médicaments) (Levine, 2023).

**Question 3**

Réponse : D

Comme le GCS du patient est de 11 et qu'il va probablement se détériorer, la préparation d'une voie aérienne définitive est prioritaire sur la liste des interventions (Levine, 2023, Mark et Goldman, 2023). Le type, la quantité et le moment de l'ingestion sont inconnus. Un lavage gastrique n'est pas recommandé, pas plus qu'un bolus de liquide, à moins que les SV ne soient instables d'un point de vue clinique. La recherche d'antidotes nécessite une évaluation plus approfondie des antécédents. L'approche ABC prévaut sur la recherche d'antidotes (Levine, 2023).

**Question 4**

Réponse : B

Une grave intoxication à la nicotine peut entraîner un collapsus respiratoire et cardiovasculaire (Barbuto, 2023 ; Henstra, 2022). Le patient peut d'abord présenter des symptômes cholinergiques tels qu'une augmentation des sécrétions buccales, des nausées, des vomissements, de la diarrhée, une élévation de la tension artérielle provoquant de l'hypertension et de la tachycardie. La phase ultérieure d'une intoxication sévère à la nicotine comprend une progression rapide vers la défaillance d'un organe et peut être létale. La léthargie, les crises d'épilepsie et le coma peuvent suivre les symptômes du premier stade. La faiblesse musculaire et le manque de tonus musculaire peuvent entraîner une paralysie respiratoire.

La priorité en matière de soins aux patients est de procéder à une évaluation dans le cadre de l'enquête primaire (Levine, 2023). Les voies respiratoires doivent être sécurisées en raison du risque de détérioration rapide de l'état clinique du patient. Il peut être raisonnable d'administrer un traitement par benzodiazépine à des fins de sédation et en cas de convulsions.

**Questions 5**

Réponse : D

L'hyponatrémie associée à l'exercice est un phénomène qui se traduit par une augmentation de l'eau libre dans l'organisme par rapport au sodium dans l'organisme. Le mécanisme principal est l'augmentation de la consommation de liquides hypotoniques, bien que la dégradation du glycogène pendant l'exercice (Rosner et Hew-Butler, 2023) soit une autre source, de même que le SIADH résultant de l'effort physique (Buck et coll., 2022). Le déroulement de l'épreuve nous indique que la personne a ingéré une quantité importante d'eau avant et pendant la course avant de s'effondrer. En revanche, il n'y a pas suffisamment d'informations pour identifier l'hypoglycémie, qui est fréquemment associée à des altérations de la perte de connaissance, la gastroentérite, qui pourrait être associée aux nausées et vomissements, ou le syndrome du QT prolongé, qui pourrait être indiqué par la sensation d'étourdissement. L'hyponatrémie entraîne un gradient osmotique qui a pour effet de déplacer l'eau libre du lit vasculaire vers le cerveau et les poumons, provoquant un œdème cérébral et une perte de connaissance (Buck et coll., 2022).

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