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# Barriers and facilitators of thromboprophylaxis for medical-surgical intensive care unit patients: A multicenter survey

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ABSTRACT

*Background:* The objective of this study was to identify the self-reported barriers to and facilitators of prescribing low-molecular-weight heparin (LMWH) thromboprophylaxis in the intensive care unit (ICU).
*Methods:* We conducted an interviewer-administered survey of 4 individuals per ICU (the ICU director, a bedside pharmacist, a thromboprophylaxis research coordinator, and physician site investigator) regarding LMWH thromboprophylaxis for medical-surgical patients in 27 ICUs in Canada and the United States. Items were generated by the research team and adapted from previous surveys, audits, qualitative studies, and quality improvement research. Respondents rated the barriers to LMWH use, facilitators (effectiveness, affordability, and acceptability thereof), and perceptions regarding LMWH use.
*Results:* Respondents had 14.5 (SD, 7.7) years of ICU experience (response rate, 99%). The 5 most common barriers in descending order were as follows: drug acquisition cost, fear of bleeding, lack of resident education, concern about bioaccumulation in renal failure, and habit. The top 5 rated facilitators were preprinted orders, education, daily reminders, audit and feedback, and local quality improvement committee endorsement. Centers using preprinted orders (mean difference [$P < .01$]) and computerized physician order entry ($P < .01$) compared with those centers not using those tools reported higher affordability for these 2 facilitators. Compared with physicians and pharmacists, research coordinators considered ICU-specific audit and feedback of thromboprophylaxis rates to be a more effective, acceptable, and affordable facilitator (odds ratio, 6.67; 95% confidence interval, 1.97-22.53; $P < .01$). Facilitator acceptability ratings were similar within centers but differed across centers ($P \leq .01$).

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*Conclusions:* This multicenter survey found several barriers to use of LMWH including cost, concern about bleeding, and lack of resident knowledge of effectiveness. The diversity of reported facilitators suggests that large scale programs may address generic barriers but also need site-specific interprofessional knowledge translation activities.



## 1. Introduction

In critically ill patients, changes in blood coagulation, inflammation, and the host immune response are intricately linked, rendering the development of venous thromboembolism (VTE) an important clinical problem [1]. Patients who develop VTE while in the intensive care unit (ICU) are at risk for longer length of stay and increased mortality [2]. Omission of thromboprophylaxis has been associated with increased risk of death for critically ill patients [3]. Thromboprophylaxis is used routinely for patients in the ICU, and pharmacologic strategies with unfractionated heparin (UFH) or low-molecular-weight heparin (LMWH) are often recommended as effective and safe approaches [4].

In medical-surgical ICU patients, a recent multinational trial showed that, compared with UFH, the LMWH dalteparin significantly reduced the risk of pulmonary embolism (PE) and was associated with a trend toward lower rates of deep venous thrombosis (DVT), VTE overall, and heparin-induced thrombocytopenia (HIT) but with no difference in major bleeding [5]. A recent meta-analysis of randomized trials enrolling more than 5000 medical-surgical critically ill patients suggested that LMWH compared with UFH reduced rates of PE (risk ratio [RR], 0.62; 95% confidence interval [CI], 0.39-1.00) and symptomatic PE (RR, 0.58; 95% CI, 0.34-0.97). There was no difference in rates of DVT (RR, 0.90; 95% CI, 0.74-1.08), symptomatic DVT (RR, 0.87; 95% CI, 0.60-1.25), mortality (RR, 0.93; 95% CI, 0.82-1.04), or major bleeding (RR, 0.97; 95% CI, 0.75-1.26) [6].

These data and a signal of benefit favoring LMWH over UFH for thromboprophylaxis in other medical, surgical, and trauma [7,8] populations support the desirability of shifting practice toward the use of LMWH in the medical-surgical ICU. Although UFH was previously less expensive than LMWH, for many centers, the cost of UFH has increased, and the cost of LMWH has decreased. Thus, the likelihood of improved clinical outcomes and lower or similar drug acquisition costs in many centers suggests that LMWH is better from a cost-effectiveness perspective [9].

Understanding center-specific barriers to the prescription of LMWH may offer insights into center-specific facilitators that may directly address those barriers. For example, if clinicians had serious concerns about LMWH bioaccumulation in patients who have renal failure causing increased risk of bleeding, then they might suggest education to review existing safety evidence [10,11] or to distinguish the lower risk of bioaccumulation with prophylactic vs therapeutic doses of LMWH [12]; alternatively, respondents may call for more research on this topic. The concept of analyzing local barriers and tailoring solutions to these barriers is foundational to "customized knowledge translation" [13], although empirical data showing the success of such an approach are modest [14].

The objective of this knowledge translation study was to identify the perceived barriers to and facilitators of prescribing LMWH for thromboprophylaxis in medical surgical ICU patients through a multidisciplinary interviewer-administered survey.

## 2. Methods

### 2.1. Design

We conducted an interviewer-administered survey of physicians, pharmacists, and research coordinators, asking about barriers and facilitators for the use of routine LMWH thromboprophylaxis in medical-surgical critically ill adults. This survey is part of a multicenter, multimethod, multiphase quality improvement program called CONECCKT-T (the Co-operative Network of Critical Care Knowledge Translation for Thromboprophylaxis), focused on prevention of VTE. Other aspects of this program included a systematic review and audit of actual practice. This work was done in collaboration with the Canadian Critical Care Trials Group (CCCTG).

### 2.2. Instrument development

#### 2.2.1. Item generation and reduction

We generated items for this instrument at an initial meeting of Research Coordinators involved in the randomized trial PROTECT (PROphylaxis for ThromboEmbolism in Critical Care Trial), followed by a literature review and email conferencing among members of the CONECCKT-T Steering Committee, representing the disciplines of medicine, pharmacy, and nursing. We considered items used in previous surveys [15,16], audits [17,18], and qualitative [19] and quality improvement studies [20]. We focused on 3 domains: respondent demographics, barriers, and facilitators. Items were reduced through serial email discussions.

#### 2.2.2. Instrument formatting

For questions about demographics of respondents, we used nominal and closed-ended questions to maximize accuracy and completeness [21]. We structured responses for possible barriers and facilitators using ordinal responses on Likert scales. We grouped barriers into 3 categories: (1) concerns about the LMWH drug class, (2) knowledge and attitudes of resident and attending physician prescribers, and (3) ICU or system barriers. Respondents rated barriers on a single 1 to 7 scale, whereby a score of 1 corresponds to not a barrier at all and a score of 7 corresponds to a very large barrier.

Possible facilitators were grouped into 4 categories: (1) education, (2) use of reminders, (3) audit and feedback, and (4) systems approaches. Respondents rated facilitators on their perceived effectiveness, acceptability, and affordability, regardless of whether these strategies were in use in their ICU. The facilitators were also rated on a 1 to 7 scale, whereby a score of 1 corresponds to a facilitator that is not effective and 7 corresponds to a facilitator that is very effective. Similarly, a score of 1 corresponds to a facilitator that is unacceptable or not affordable, whereas a score of 7 corresponds to a facilitator that is very acceptable or very affordable. We asked respondents to rank the top 3 barriers to the use of LMWH in their ICU and to list the top 3 facilitators with additional free text options. We also asked about respondent perceptions of and inclinations toward LMWH utilization (Appendix A, Survey Instructions and Instrument).

#### 2.2.3. Instrument testing

Pretesting involved 3 research coordinators and 3 attending physicians in the CCCTG. During a knowledge translation meeting of the research coordinators, we sought feedback on the scope, item clarity, and completeness of the survey instrument. We modified the instrument based on this feedback. We also conducted clinical sensibility testing with 5 nurses and 5 physicians who evaluated 7 domains using a 1 to 5 Likert scale [22]. The scores were (median [interquartile range {IQR}]): criterion validity 5 (0), comprehensiveness 5 (0), clarity of questions 5 (1), clarity of response options 5 (0.25),