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Long emergency department length of stay: A concept analysis

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ABSTRACT

Introduction: Emergency Department (ED) Length of stay (LOS) has been associated with poor patient outcomes, which has led to the implementation of time targets designed to keep EDLOS below a specific limit. The cut-offs defining long EDLOS varies across settings and seem to be arbitrarily chosen. This study aimed to clarify the meaning of long EDLOS.

Methods: A concept analysis using the Walker and Avant approach was conducted. It included a literature search aiming to identify all uses of the concept, resulting in a set of defining attributes and a way of measuring the concept empirically.

Results: Long EDLOS was primarily used as proxy for other phenomena, e.g. boarding or crowding. The definitions had cut-offs ranging between 4 and 48 h. The attributes defining long EDLOS was *waiting, a crowded ED environment* and *an inefficient organization.*

Discussion: Time targets are probably more suitable when directed towards and tailored for specific sub-groups of the ED population.

1. Introduction

Emergency department (ED) length of stay (LOS) is a widely used measure in research concerning almost every aspect of processes within the emergency department. Emergency department length of stay (EDLOS) can be defined as the time interval between a patient's arrival to the ED to the time the patient physically leaves the ED [1]. The use of the EDLOS measure varies from a primary outcome measure in studies evaluating clinical interventions [2] and organizational improvements [3], to an indicator of ED crowding [4,5]. Decreased patient satisfaction and quality of care [6,7], as well as increased mortality both for admitted and discharged patients [5,8] has been found to be associated with EDLOS.

Public pressure and media attention have led to the implementation of time-targets for EDLOS, promoting EDs to disposition patients within a designated time-frame [9]. A proportion of the ED patient population will *per definition* experience *long* EDLOS, as opposed to normal or acceptable EDLOS, as a result of a distinct and predefined cut-off for EDLOS. It is unclear exactly what time targets were initially supposed to address [10]. However, later studies have shown long EDLOS, defined as longer stay than specific time targets, to be associated with poor outcomes [11]. Furthermore, it is unclear why the preferred target differs depending on the setting (e.g. 4 h in England [12] compared to 6 h in Ireland [13]). Because of these discrepancies, it is unclear exactly what the concept of *long* EDLOS means.

The necessity of comparing different interventions aimed towards enhancement of ED processes has driven the scientific community towards uniform reporting of performance measures and quality indicators [1,14]. The summits of the Emergency Department Benchmarking Alliance (EDBA) [1,15,16] as well as an international panel of experts assigned by the International Federation for Emergency Medicine (IFEM) [14], along with multiple review studies aiming to identify important measures in emergency medicine research [17,18], all recognize EDLOS as a key performance indicator. However, the nature of the association between long EDLOS and poor outcomes has not been clarified.

The current study aimed to analyse different uses in the literature of the concept 'long EDLOS' in order to clarify its meaning.

2. Methods

The Walker and Avant approach for concept analysis was used [19].

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This approach enables an examination of the structure and function of the concept [19], which corresponds to the aim of the study. The approach consists of eight steps. The first two steps: (1) *select a concept* and (2) *determine the aim or purpose of the analysis* are explained in the introduction to the current study. The third step: (3) identify all uses of the concept consists of an extensive review of the literature (see '*review of the literature*', below, for a detailed description). Step four: (4) *determine the defining attributes*, described by Walker and Avant as "the heart of concept analysis" [19], is a way of displaying the array of characteristics most frequently associated with the concept. This was done by analysing the text describing the identified uses of the concept, looking for recurring properties, characteristics or attributes.

Steps five and six includes the construction and presentation of cases. The cases are narrative descriptions of situations that clarifies the concept by using the defining attributes in a context that can be relatable to the reader. Ideally, *the model case* (5) describes a situation where all the defining attributes are present, whereas the *additional cases* (6) clarifies situations that are related to the concept - but emphasizes the characteristics that are absent. The cases contribute to understanding of what the concept is, but also what it is not. A multitude of different types of cases can be used, including: related, borderline, contrary, invented and illegitimate cases [19]. In the current study a model case and a borderline case was found to be sufficient.

The seventh step is *to identify antecedents and consequences* (7), which means describing the conditions that must be in place for the concept to occur and the events that occur as a result of the concept. Finally step eight: (8) *define the empirical referents*, is an attempt to describe how the concept can be measured "in the real world". This step is necessary in case the defining attributes are too abstract to detect empirically [19].

2.1. Review of the literature

The PubMed and CINAHL databases were searched to find literature to explain the concept of long EDLOS. Synonyms to the term *long* – i.e. *prolonged*, *extended* and *protracted* was also used. In addition to *emergency department,* the term *emergency room* was used. All reference lists were searched for additional studies, reports and grey literature. Dictionaries were studied to clarify the meaning of the word long. No publication time limits were set, but the search was limited to text written in English or Swedish. A research librarian was consulted to ensure good quality in the literature search.

Both database searches were conducted by combining the search terms long, prolonged or extended with emergency department or emergency room and stay – resulting in the following syntax: ((long OR prolonged OR extended) AND (emergency department OR emergency room) AND stay). The search was conducted in all fields of the databases. This approach was used to minimize the risk of failing to detect literature that may be useful. The first screening was done by title, to exclude records of obvious irrelevance. The database search procedure is illustrated using a PRISMA flow chart (Fig. 1).

3. Results

The result of the literature search and the analysis of the findings is presented below, starting with the uses of the concept of long EDLOS.

3.1. Uses of the concept

Oxford Advanced Learner's Dictionary lists the following meanings of the word *long* (in relation to time):

1. Lasting or taking a great amount of time or more time than usual: *He's been ill (for) a* ***long*** *time*.
2. Used for asking or talking about particular periods of time: *How* ***long*** *is the course?*
3. Seeming to last or take more time than it really does because, for example, you are very busy or not happy: *I'm tired. It's been a* ***long*** *day*. [20]

In scientific studies the concept of long EDLOS was used both as an explanatory variable [21–23] and as an outcome [24–26]. In most cases, long EDLOS was used as a proxy for another phenomenon which was either more intangible than EDLOS, e.g. *crowding* or *quality of care* - or harder to measure due to data unavailability, e.g. waiting or boarding.

One common use was long EDLOS as a proxy for quality of care, e.g. to represent timeliness [27,28] or efficiency [24,29,30]. Other common proxy-use were for long EDLOS to represent crowding [22,23,26,31,32] or boarding [25,30,33].

"Emergency department (ED) crowding is common and associated with increased costs and negative patient outcomes. The aim of this study was to conduct an in-depth analysis to identify the root causes of an ED length of stay (ED-LOS) of more than six hours" Driesen et al. [26], problematizing ED Crowding – but investigating long EDLOS.

Sometimes long EDLOS was used simply to represent excessive time spent in the ED. In these cases, long EDLOS was used as risk factor - testing its contribution to decreased patient satisfaction [6], crowding [21] and decreased patient safety [34–36]. The cut-off for long EDLOS in scientific journals ranged between 4 and 48 h [21–36].

The origin of many definitions of long EDLOS was based on different national or regional time targets [23,28,31,32,35]. Time targets for EDLOS were designed in different ways, but they all had a cut-off time and a percentile goal representing the proportion of patients expected to have EDLOS within this time target. Thus implying that exceeding the time target was defined as *long* EDLOS. Some time targets were connected to financial incentives meant to promote compliance to said time target [12,37,38].

Most time targets were used to reduce waiting, which was found to be the case in England [12], New Zealand [39], Ontario [37] and Ireland [13], while the Australian time target focused more on accessibility [38]. The preferred cut-off for national time targets ranged between 4 and 8 h. On introduction, none of the targets were supported by scientific evidence.

"6 h is a reasonable amount of time - long enough for good clinical care but not unjustifiably long" New Zealand Ministry of health [39], justifying the choice of the 6 h cut-off.

"When people use the present emergency services in the NHS, they often find: They have to wait too long for care and treatment at each stage within the emergency care system" United Kingdom Department of Health [12] supporting the implementation of the "4 h rule".

3.2. Defining attributes

The defining attributes are the characteristics that let us know that we are facing a specific concept [19]. Based on the identified uses of the concept, the following attributes emerged: *Waiting*, a *crowded ED environment* and *resource block*. Waiting was the most acknowledged attribute associated with long EDLOS. Without waiting, we most likely would not consider time spent in the ED to be a problem, and there would be no need for time targets.

Crowding was described as a cause of long EDLOS and several studies used long EDLOS as a proxy for crowding [21,26,29,31]. Conversely, the Canadian Association of Emergency Physicians (CAEP) implied the opposite direction of causality, as they proposed a time-limit for EDLOS as a solution to ED crowding [40]. The relationship between long EDLOS and crowding was both intimate and complex, as it was described as both cause and effect of crowding. It was, however, not within the scope of the current concept analysis to determine the direction of a potential cause-effect relationship, but it can be concluded that these concepts were closely connected.

An inefficient organisation refers to sub-optimized organisational

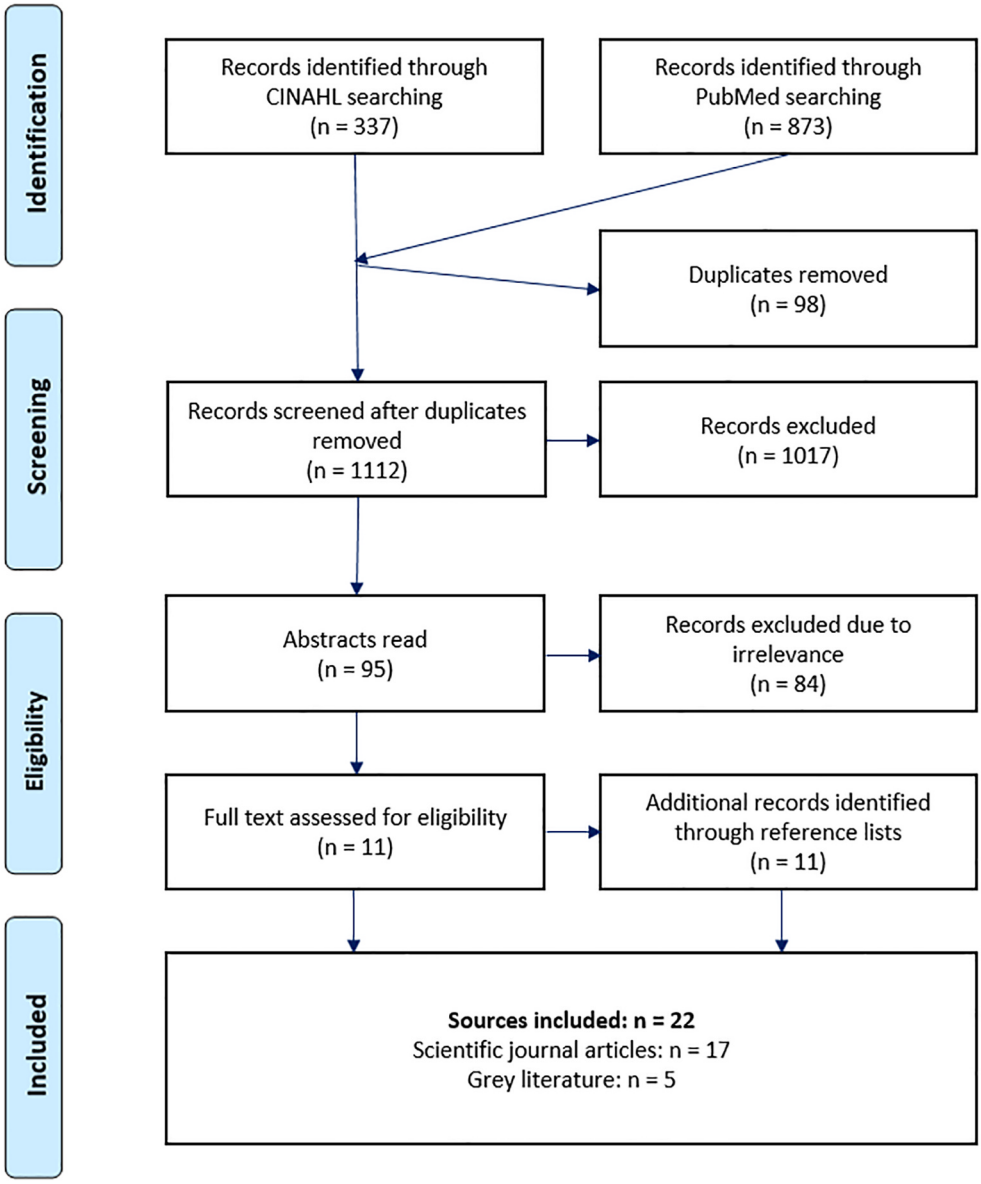

Fig. 1. PRISMA flow chart.

structure, which was one of the main problems that EDs were trying to tackle by avoiding long EDLOS [24,29,30]. The assumption, made by these publications, was that when EDLOS exceeded a specific time, long EDLOS was considered as an indicator of inefficiency.

3.3. Constructed cases

Constructed cases are examples that help clarify the concept, to determine what it is and, maybe more importantly; what it is not. The model case is a constructed case that has all the defining attributes of the concept. The borderline case resembles the concept but lacks one or more of the defining attributes [19].

3.3.1. A model case

Edith is an 89-year-old woman, with history of hypertension and diabetes. For a few days, she has been experiencing vertigo and fatigue. On a Monday afternoon her general practitioner decides that Edith must be brought to the ED to rule out several possible conditions that might be responsible for her symptoms. Upon arrival to the ED, Edith is registered and placed on a stretcher in a hallway. She is informed that the triage-nurse will see her soon. After an hour (waiting), the nurse arrives, asking questions, measuring blood pressure and other vital signs. Edith is told that she will have to wait for the doctor (waiting). As time goes by, Edith becomes hungry and she also needs to use the bathroom, but she is afraid to walk without her cane and she doesn't want to disturb the nurses, who all look extremely stressed (crowding). After a quick examination by a young doctor, the waiting continues, without any information about what she is waiting for, or how long it is going to take (waiting). Finally, a nurse draws some blood and later she is taken to radiology to have her head scanned. Edith remembers reading in the newspaper that no patient is supposed to wait more than 4 h in the ED, but now it seems that more than 6 h has passed. Cautiously, Edith asks a nurse how long she is supposed to stay in the ED. In response, the nurse informs her that the doctors are very busy and that there are patients who are a lot sicker that need to be tended to first (crowding). Finally, another doctor informs Edith that they cannot find anything wrong with her and that she will be sent back to the nursing home. After 13 h, Edith leaves the ED, with a feeling that she has unnecessarily burdened the health care system (inefficiency). She is hungry, tired and her body aches from spending all that time on an uncomfortable stretcher.

3.3.2. A borderline case

On the day of the first snow, 48-year-old Tom is out walking his dog. Covered by a thin layer of snow is an ice patch, causing Tom to slip and fall. He hurts his wrist badly and goes to the ED to have it checked out. The waiting room is full of people, most of whom seem to have similar injuries to Tom's (crowding). He is informed by the nurse at the registration desk that he should expect long waits, due to the heavy workload on both radiology and the orthopaedic on call. After 30 min Tom gets called into an examination room by a doctor. After a quick examination the doctor gives him a temporary supportive splint, which relieves the pain considerably. He is also offered some analgesics. After 4 h of waiting, he is finally called into the radiology department to have his wrist x-rayed (waiting). A while later the doctor comes to the waiting room to inform Tom that the wrist is fractured, and that he will be getting a cast. There will be more waiting, but he can have more analgesics if he needs them, and he can eat, because there is no need for surgery. After a total time of more than 10 h (waiting), Tom is discharged from the emergency department. He is a bit tired, but pain-free and completely satisfied with the care that he has received.

3.4. Antecedents and consequences

Antecedents are the events or incidents that must occur, or be in place prior to the occurrence of the concept [19]. The analysis identified a number of potential causes to long EDLOS, including crowding [32], boarding [26,30] and high level of patient complexity (e.g. old age, cognitive impairment, need for advanced imaging or extensive blood testing) [24,26,28,30,34,36], but only one criterion was absolutely essential – and that was the predefinition of long EDLOS, e.g. the setting of a national, regional or local time target. The setting of a time limit for EDLOS created an expectation, either from a patient- or an organisational point of view. When expecting EDLOS to be limited to a specific time frame, breaching this limit enables us to consider the EDLOS as long.

The consequences of a concept are the events that occur as a result of said concept [19]. Our analysis identified the following potential consequences of the concept long EDLOS: Decreased patient satisfaction and decreased patient safety, including increased mortality, increased risk of adverse events and worse adherence to clinical guidelines [22,23,31,33–35].

3.5. Empirical referents

The empirical referents refer to the set of measurement that allows us to detect the presence of the concept "in the real world" [19]. The analysis was unable to identify one single time-limit for long EDLOS that was superior to other time-limits in any way. To identify such a time-limit, one should consider at what point in time the EDLOS leads to decreased patient satisfaction and decreased patient safety. These time-points are probably different in different settings and most likely also for different sub-groups of the ED population.

4. Discussion

The current study analyzed the different uses of long EDLOS in the literature, in order to clarify the meaning of the concept. The concept analysis revealed a wide-spread use of long EDLOS as a proxy for other concepts and phenomena. The uses of long EDLOS enabled understanding of the attributes defining the concept, but also suggested that the problem of long EDLOS was not the time spent in the ED – the main problems are other, often unmeasured, phenomena associated with long EDLOS, such as crowding, boarding, waiting or decreased patient safety.

ED crowding is a worldwide problem, associated with delayed treatment, decreased patient satisfaction and increased morbidity and mortality [7,41]. ED crowding occurs when the need for emergency care exceeds available resources in the ED, the hospital or both [42]. The use of long EDLOS as a proxy for crowding is common and reasonably logical [21,26,29,31]. Regardless of how crowding is defined or measured, it will almost certainly lead to a longer stay in the ED [43]. EDLOS is a measure that is easy to capture, and – since it reflects the entire patient stay - it is likely to be affected by crowding regardless of where in the ED process the patient is exposed to crowding [44,45]. However, long EDLOS, defined by an arbitrary cut-off, runs the risk of being both an insensitive and unspecific indicator of crowding.

Boarding is defined by the American College of Emergency Physicians (ACEP) as "the practice of holding patients in the emergency department after the patient has been admitted" [46]. A practice that has potential disadvantages both for the admitted patient, and the ED staff [47]. According to ACEP, boarding time starts at the time of the decision to admit and ends when the patient physically leaves the ED [46]. However, long EDLOS is a dubious proxy for boarding as EDLOS also includes reasons other than boarding that can make the EDLOS long, e.g. consultations, diagnostic imaging and laboratory testing.

In a similar way as with boarding, long EDLOS has also been used as a proxy for waiting [12,27]. This use is not supported by the ACEP policy, stating that wait time in the ED should be defined as the time between arrival and first contact with a provider (either a physician, an advanced practice nurse or a physicians assistant), and this "door to provider contact time" should be the sole metric for reporting ED patient wait time [48]. However, the ACEP policy is not a consensus definition. In a strategy statement issued by a provincial government in Canada, it was stated that "A patient's wait time starts as soon as they walk through the doors of an emergency department and doesn't end until the patient is either discharged home or admitted to hospital" [49]. In a similar way, the United Kingdom Department of health described the total time from arrival to discharge as wait, when introducing the 4 h-rule [12]. The patient experience of waiting has been studied in several research papers and it's hard to find support for either a "door to provider"- or an EDLOS-based proxy for waiting [50,51].

The consequences of long ED LOS include several patient safety risks, including increased mortality [4]. However, most of these risks were found in specific sub-groups of the ED population. E.g. older patients [23,34], patients with myocardial infarction [22,33] or among patients admitted to critical care [35]. Evidence of the adverse effect of longer EDLOS on a general ED population is easier to find when EDLOS is used as a continuous variable [7,52,53]. This suggests that for a general ED population, there are patient safety issues associated with long EDLOS, but the pursuit of an arbitrary time target may not be the best way of addressing those issues. General time-limits, aiming to keep EDLOS for all patients within a certain time-frame, have the potential to jeopardize patient safety by prioritizing patients at risk of breaching the time-target, instead of patients at the risk of deterioration [54]. To balance this, a set of robust quality indicators, including e.g. rate of unscheduled re-visits, patient satisfaction and rate of missed diagnoses, could be used [55].

4.1. Strengths and limitations

The current study is, to our knowledge, the first concept analysis of the concept of long EDLOS. A purposeful data collection was used and therefore the study lacks the rigor of a systematic review. This may have led to some sources of information being overlooked. However, a systematic review would fail to capture the nature of long EDLOS, since much of the literature describing the concept, does so in implicit terms.

5. Conclusion

Long EDLOS is a concept often used in the literature to represent other phenomena, which are difficult to define or measure. *The defining attributes of long EDLOS are waiting, crowding and an inefficient organization.* We suggest that future studies focus on identifying both the

causes of organisational inefficiencies and sub-populations of ED patients (e.g. the frail elderly), who would benefit from having their EDLOS limited to a specific time-frame and at what point in time the limit for EDLOS should be set.

6. Declarations

(1) **Ethical statement:** The study is aligned with Ethical guidelines for journal publication
(2) **Funding:** Jonas Andersson's doctoral education is partially funded by the non-profit organisation: Centre for Clinical Research Sörmland/Uppsala University, Mälarsjukhuset, Eskilstuna, Sweden.

CRediT authorship contribution statement

Jonas Andersson: Formal analysis, Investigation, Writing - original draft, Visualization. **Lena Nordgren:** Validation, Writing - review & editing. **Ivy Cheng:** Writing - review & editing. **Ulrica Nilsson:** Conceptualization, Writing - review & editing. **Lisa Kurland:** Conceptualization, Supervision, Writing - review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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