

## QUALITY IMPROVEMENT The essence of healthcare records: embedded electronic health record system microblogging functionality for patient care narrative

**Authors:** Shankar Sridharan,<sup>A</sup> Catherine Peters,<sup>B</sup> Sarah Newcombe,<sup>C</sup> Christopher Jephson,<sup>B</sup> Robert Robinson,<sup>B</sup> Bregje Mulder,<sup>D</sup> William Houghton,<sup>E</sup> Sheena Visram<sup>F</sup> and Neil J Sebire<sup>G</sup>

### ABSTRACT

#### Introduction

Electronic health record (EHR) systems capture information relating to patients across many specialties but can be complex, making rapid evaluation and communication of current important issues difficult.

#### Methods

As part of a children's hospital EHR implementation, we developed and implemented an embedded microblogging platform to allow users to provide a short summary of main issues or actions relating to the encounter, 'Essence' capturing the essence of the interaction. We reviewed usage by specialty and user type over a 1-year period.

#### Results

Ninety-one thousand, nine-hundred and fifty Essence entries were committed across 49 specialty areas during a 12-month period, April 2019 – April 2020. The specialties with greatest usage were cardiology, neurosurgery, intensive care, respiratory medicine and neurology, with 70% of entries by nursing staff. The median number of words used per entry was 17 words (range 1–120; mean 20.7), and microblogs were mainly used to describe actions, events or planned care. Manual content analysis of 200 representative entries demonstrated categories of importance (including clinical status, treatment plan, investigations, procedures and diagnoses) suggesting appropriate clinical utility.

#### Conclusion

**Incorporation of an embedded EHR microblogging platform to capture key interactions with healthcare**

**professionals represents a novel approach to coordinating care communication and is widely used across specialties, especially by nursing staff.**

**KEYWORDS:** electronic health records, micro blogging, narrative, Essence

**DOI:** 10.7861/fhj.2021-0047

#### Introduction

Comprehensive electronic health record (EHR) systems provide a way of capturing information relating to patients throughout their care across a range of healthcare specialists including medical, nursing and allied health professionals. However, such systems can be complex, making rapid evaluation and communication of the current most important issues difficult. Previous studies have reported specifically that barriers include adequate information presentation, minimising cognitive load and navigation through the record.<sup>1–3</sup>

Social media microblogging platforms, such as Twitter, are designed to allow posts or messages with a limited number of characters or words, and such platforms have been used by healthcare to create virtual communities for engagement, knowledge translation and research dissemination.<sup>4–6</sup> In addition, there is one report of use of a local microblogging platform to improve communication in acute care settings through a forum where healthcare professionals could communicate regarding care plans. This was trialled for around one-third of patients admitted to a medical intensive care unit over a 6-month period and was mainly used for coordinating care and summarising clinical events, but barriers included platform access and usage.<sup>7</sup>

In view of the need for healthcare professionals in a complex organisation to have a rapid access to current issues regarding their patients, and the recognition that navigation around complex EHR systems can be a barrier to communication, we introduced a microblogging platform fully integrated in to the EHR system. This was specifically designed for all involved in clinical care to be able to provide an easily accessible and brief summary of the current issues ('Essence' capturing the essence of the encounter) to include the main message, action or plan from any clinician (doctor, nurse or allied health professional) – patient

**Authors:** <sup>A</sup>chief clinical information officer (CCIO), Great Ormond Street Hospital for Children, London, UK; <sup>B</sup>medical information officer (MIO), Great Ormond Street Hospital for Children, London, UK; <sup>C</sup>chief nursing information officer (CNIO), Great Ormond Street Hospital for Children, London, UK; <sup>D</sup>EHR business intelligence manager, Great Ormond Street Hospital for Children, London, UK; <sup>E</sup>EHR design and delivery lead, Great Ormond Street Hospital for Children, London, UK; <sup>F</sup>PhD student, University College London, London, UK and Great Ormond Street Hospital for Children, London, UK; <sup>G</sup>chief research information officer (CRIO), NIHR Great Ormond Street Hospital BRC, London, UK

interaction. Microblogging is not intended to provide a holistic picture or replace traditional documentation but rather provide supplementary and actionable indicators in a glanceable manner. The intention of the current study is to describe the concept of a novel clinically active microblogging platform. Here, we present a review of the usage of such a platform during a 1-year period following its introduction.

## Methods

The 'Essence' microblogging platform was developed and implemented alongside the implementation of a comprehensive EHR system at a specialist children's hospital.<sup>8</sup> It was designed to allow users to provide a maximum 156 character summary of the main issues or actions relating to the encounter; it was based on 156 characters for brevity and to create a micro-narrative (the character length was chosen to align with the most popular social media microblogging tool). A stacked display of these Essences, from those involved with patient care creates a readily accessible micro-narrative supporting a patient's care, thus avoiding the need to read through multiple, full document types to identify the key information. Completed Essence entries are labelled with the name of the user and the department of the login and create a visual micronarrative (Fig 1).

Four-thousand, six-hundred and one staff members (99.5%) of our workforce had an average of 8 hours training on EHR use prior to going live. All staff EHR training included demonstration of Essence with information about aims and contingent benefits. Staff were encouraged to complete an Essence entry after every clinical interaction with a patient. Message structure and composition were

not regimented, and it was communicated that the message should be naturally brief and intended to capture a summary statement to a colleague. It was suggested that helpful elements to include in the Essence were key findings, actions, decisions and a plan, where relevant. The brevity of the message, observed clinical utility during training and ongoing use by peers has helped adoption and establish incorporation into standard practice.

We reviewed the metrics regarding overall usage by specialty and user type extracted from the EHR system and extracted deidentified content from example areas in order to evaluate its usage metrics with descriptive statistics. In addition, we used a subsample of 1,000 entries from one of the most common specialties (cardiology) and user types (nursing) to identify the 100 most common words and phrases through a 'bag of words' approach to generate word clouds in order to examine which clinical issues were most commonly documented in this way.<sup>9,10</sup> In addition, 200 consecutive entries were selected from an arbitrary period in the middle of the study, including 100 consecutive entries from nursing and 100 consecutive entries from medical staff, within the same specialty and with all entries during the same time period. Entries were manually read and all 200 deidentified entries classified according to the content of the microblogging entry text, specifically in relation to one of seven categories (clinical status, treatment plan, investigations, procedures, social factors, advice and diagnosis), in addition to calculating the number of words per entry. Mann-Whitney *U* and comparison of proportion / chi-squared tests were used to compare nursing versus medical entries.

The study involved retrospective service evaluation of routinely collected non-identifiable clinical data from the EHR system only with no data sharing outside of the EHR team and hence was exempt from Health Research Authority and research ethics committee approval ([www.hra-decisiontools.org.uk/research](http://www.hra-decisiontools.org.uk/research)).

### Essence: Last Filed per Specialty

	Value
Cardiology	Needs repeat MRA to define if further (additional)stroke. If so needs re-discussion with Neuro and Haem with ?need for anticoagulation.
Dietetics	Feed changed from Aptimil to Similac HE and EBM to optimise catch up growth
Occupational Therapy	OT completed developmental review. No further need for OT input
Speech and Language	Managing full bottle feeds when awake. No further SLT input unless any new concerns.
Nursing	Floopy episode and desat to 40% today, septic screen done, feed on hold- 100% IV fluids and started on IVABS.
Social Work	Family Support - Housing and financial

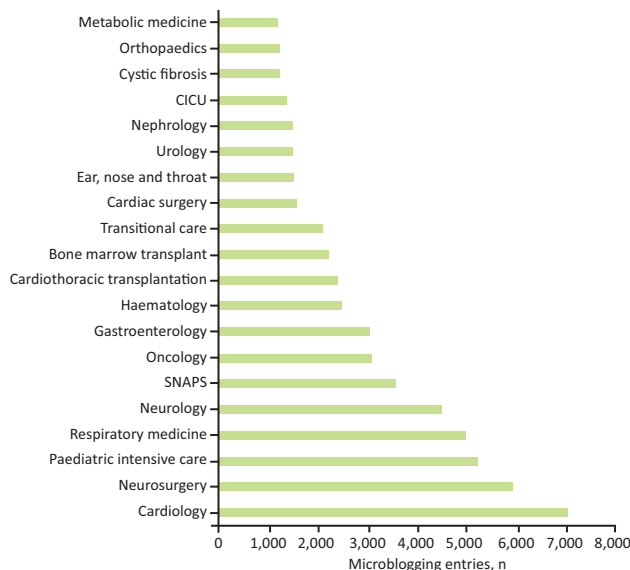
**Fig 1. Exemplar screenshot demonstrating the types of typical entries in the Essence clinical microblogging platform.** Integrated as a key component across a comprehensive electronic health record system. desat = desaturated blood oxygen; EBM = expressed breast milk; Haem = haematology; IV = intravenous; IVABS = intravenous antibiotics; MRA = magnetic resonance angiography; Neuro = neurology; OT = occupational therapy; SLT = speech and language therapy.

## Outcomes

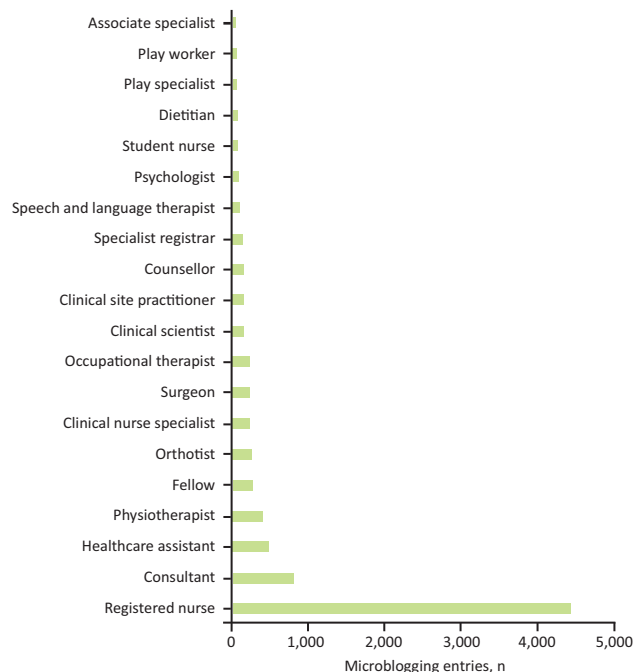
The Essence tool was implemented in April 2019 at the time of the EHR going live. During the 12-month period, April 2019 – April 2020, 91,950 Essence entries were committed across 49 specialty areas, and now represent a component of routine care across many specialties (Fig 2). The five specialties with greatest usage were cardiology, neurosurgery, paediatric intensive care, respiratory medicine and neurology, with around 56% (51,418/91,950) of all entries by nursing staff (Fig 3).

Across all entries, the median number of words submitted per entry was 17 words (range 1–120; mean 20.7), and microblogs were mainly used to describe actions, events or planned care. Text mining and word cloud analysis of 1,000 randomly selected representative entries from a specialty (cardiology) and an entry type (nursing) demonstrated the commonest terms included urine outputs, chest drains and blood gases, as well as terms relating to parents and overall patient and family wellbeing (Fig 4).

The number of words used per entry was significantly fewer for medical vs nursing entries (median 12 (range 1–24) vs median 14 (range 2–97), respectively;  $Z=3.77$ ;  $p=0.002$ ), whereas the number of concepts mentioned per entry was significantly greater (median 2 (range 1–4) vs median 1 (range 1–3);  $Z=3.39$ ;  $p<0.0001$ ). Specifically, nursing entries documented proportionately more procedures (chi-squared 10.7;  $p=0.001$ ), whereas medical entries documented proportionately more diagnoses (chi-squared 31.8;  $p<0.0001$ ), with no difference in documentation of other categories ( $p>0.05$  for all; Fig 5).



**Fig 2. Data from 91,950 clinical microblogging entries during a 1-year period, demonstrating use across a wide range of specialties.** CICU = cardiac intensive care unit; SNAPS = specialist neonatal and paediatric surgery.



**Fig 3. Data from 91,950 clinical microblogging entries during a 1-year period, demonstrating use by a wide range of healthcare practitioners, with prominent nursing use.**

### Discussion

Findings of this study have demonstrated that incorporation of an EHR embedded microblogging platform to capture the core essence of interactions with a wide range of healthcare

professionals represents a novel approach to coordinating care communication and is widely used in routine care across a large



**Fig 4. Analysis of 1,000 unselected deidentified microblogging entries from cardiology and nursing, illustrating the most commonly used words.**

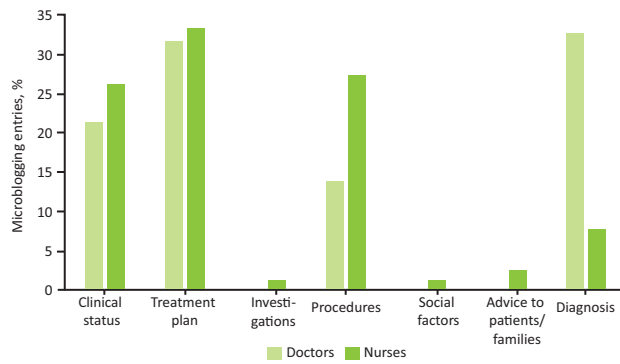


Fig 5. Proportion of microblogging entries.

range of specialties, especially by nursing staff. The microblog entries, while audited and included as part of the patient record, are not designed to replace any of the existing elements of the EHR (such as formal clinical notes or consultations) but are designed to enhance the overall functionality of the system by allowing healthcare professionals to quickly and efficiently understand core recent events regarding specific patients in order to aid navigation to specific other parts of the record. Further to a list of completed notes, Essence enables a rapid overview of the main issues raised within a note and encourages interactive connections between practitioner notes and reviews. Essences highlight the main message of the interaction, analogous to an email subject line. The micronarrative created from multiple Essences further form a valuable clinical micronarrative of care since all previous Essences are readily viewable in multiple areas of the EHR chart (chart review and timeline views).

The Essence microblogging functionality, therefore, represents a visualisation and communication tool to display the key messages, assessments and plans from all clinician–patient interactions, with each message restricted for brevity and creating an evolving micro-narrative (Fig 1). These entries are ‘stacked’ both temporally and across multidisciplinary teams to create a rapidly accessible narrative of progress, current issues and trajectory of care. Furthermore, such entries act as signposts to select the most appropriate note for detailed review, with the aim of improving efficiency of interactions, while aggregating the key findings from a wide group of clinical staff within the patient record. Selecting an individual Essence entry opens the associated detailed EHR note to support rapid search and review.

The data presented here, based on more than 90,000 microblogging entries over the course of a year across 50 specialty areas and including a wide range of healthcare professionals illustrates the rapid uptake and widespread use of such an approach. Compared with longhand narratives, the microblogging approach generally results in significantly more concise representation of the core events, with around 20 words being the average entry length across the platform. Usability has now been recognised as representing a significant issue with EHR systems and remains problematic. Based on standardised usability scores, there has been little overall recent improvement in usability for most products.<sup>11</sup> Furthermore, there is recent evidence that EHR use contributes to physician burnout, with two major factors being the use of long cut-and-pasted notes and notes geared

toward billing.<sup>12</sup> The microblogging platform approach presented here should, we hope, mitigate some of these issues by offering improved user experience, ease of use and cognitive fluency. This is particularly important in conditions where staff experience high levels of discontinuity in task execution due to multitasking, which is common in healthcare. Nursing documentation in high intensity areas is important and also time pressured; the uptake of the microblogging functionality by the nursing group into their workflow is suggestive that Essence is adding value and enhancing communication.

This study does not attempt to examine in detail the content of the microblogs compared with full clinician notes in the EHR, since this would require manual access to individual, identifiable records, rather we aimed to examine usage and uptake between clinical staff groups and examine in detail the content of a sample of entries, specifically to understand the types of usage and to compare differences in use between clinical staff groups. The majority of entries included one or more of the main categories of clinical status, treatment planning, investigations or procedures and diagnosis, with medical staff writing shorter entries focusing more on diagnostic issues and treatment planning, and nursing staff entering more text and reporting on procedures and clinical status. These findings illustrate both the potential value of such short documentation to convey important information in relation to multiple issues, and also highlight the differences in specific use cases between healthcare professional groups.

We also demonstrate, by analysing microblog content in a subset of cases, that it should be plausible to interrogate such content at scale in near real time through advanced and scalable natural language processing approaches in order to understand changes and evolution in key word use in relation to clinical outcomes and diagnoses, for example. Finally, the feasibility of additionally using further text content processing tools (such as sentiment analysis algorithms) has been demonstrated. It should be noted that the intention of the current analysis was a proof of principle demonstration using a generic word cloud analysis tool to illustrate the feasibility of the approach, which may be useful for understanding trajectories of patient journeys. In order for appropriate use in clinical or operational contexts across an EHR platform, specialised analysis algorithms should be developed, ideally specific to either organisations or disease specialties, in order to account for the particular complexities and phrases used in relation to positive, neutral or negative sentiments, for example, since these are likely from generic engines trained on social media.

## Conclusion

We have demonstrated that the rapid development and implementation of a clinical microblogging platform integrated into a comprehensive EHR system at a specialist hospital and demonstrated widespread usage across a range of specialties and health professional types. Based on around 90,000 entries, the majority of users understood the concept of using the microblogging platform to provide a concise summary of the immediately important issue, with the average length of the entry being around 20 words. As devices in healthcare are miniaturised, with corresponding demand to access EHRs via smartphones and smartwatches, it is likely that micronarratives and microblogging that augment the surrounding environment will become more popular. Such clinical microblogging platforms may mitigate some of the communication and usability adverse effects of EHR

systems and may be further extended to redesign and streamline computer interactions for specialist opinions (such as radiology and pathology) and to incorporate technologies (such as voice dictation and recognition). ■

## References

- 1 Roman LC, Ancker JS, Johnson SB, Senathirajah Y. Navigation in the electronic health record: A review of the safety and usability literature. *J Biomed Inform* 2017;67:69–79.
- 2 Zahabi M, Kaber DB, Swangnetr M. Usability and safety in electronic medical records interface design: a review of recent literature and guideline formulation. *Hum Factors* 2015;57:805–34.
- 3 Tyllinen M, Kaipio J, Lääveri T. A framework for usability evaluation in ehr procurement. *Stud Health Technol Inform* 2018;247:446–50.
- 4 Gomes C, Coustasse A. Tweeting and treating: How hospitals use twitter to improve care. *Health Care Manag (Frederick)* 2015;34:203–14.
- 5 Schnitzler K, Davies N, Ross F, Harris R. Using Twitter™ to drive research impact: A discussion of strategies, opportunities and challenges. *Int J Nurs Stud* 2016;59:15–26.
- 6 Roland D. Social media and the digital health arena. *FHJ* 2017;4:184–8.
- 7 Dalal AK, Schnipper J, Massaro A *et al*. A web-based and mobile patient-centered “microblog” messaging platform to improve care team communication in acute care. *J Am Med Informatics Assoc* 2017;24(e1):e178–84.
- 8 Epic: with the patient at the heart. [www.epic.com](http://www.epic.com)
- 9 Wikipedia. *Bag-of-words model*. Wikipedia. [https://en.wikipedia.org/wiki/Bag-of-words\\_model](https://en.wikipedia.org/wiki/Bag-of-words_model) [Accessed 13 August 2020].
- 10 MonkeyLearn. *Text analysis*. MonkeyLearn. <https://monkeylearn.com/text-analysis> [Accessed 13 August 2020].
- 11 Gomes KM, Ratwani RM. Evaluating improvements and shortcomings in clinician satisfaction with electronic health record usability. *JAMA Netw Open* 2019;2:e1916651.
- 12 Kroth PJ, Morioka-Douglas N, Veres S *et al*. Association of electronic health record design and use factors with clinician stress and burnout. *JAMA Netw Open* 2019;2:e199609.

**Address for correspondence: Dr Shankar Sridharan, Great Ormond Street Hospital for Children, Great Ormond Street, London WC1N 3JH, UK.  
Email: shankar.sridharan@gosh.nhs.uk**