Eastern AHSN

Health Enterprise East
Realising Innovation

Evaluation of the Implementation of Medic Bleep at West Suffolk Hospital

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Executive Summary

The aim of this evaluation was to assess and review the implementation of an innovative, secure messaging service (Medic Bleep) for health care professionals at West Suffolk Hospital, following a successful pilot. Medic Bleep was developed to facilitate more efficient and effective communications between clinical staff.

A Logic Model was developed to inform discussion on the potential benefits of Medic Bleep and the metrics which could be collected to demonstrate those benefits. These benefits and metrics were discussed and agreed with representatives from all key stakeholders involved the implementation and evaluation.

Methods for collecting data included a time and motion analysis of individuals in two clinical areas (pharmacy and the emergency department), a review and comparison of selected operational performance data from the hospitals data systems, as well as staff surveys. Data was collected during a baseline period and subsequently compared with equivalent data from a period following the implementation of Medic Bleep.

Results from the time and motion study were inconclusive. While there was an improvement in the observed task duration in pharmacy, it is difficult to directly attribute this change to the introduction of Medic Bleep as the sample size was relatively small and there are many other external factors involved. Furthermore observed changes in response times did not result in a statistically significant change to the duration of the overall task (typically medication being dispensed). A similar scenario was observed in the Emergency Department.

Clinical data showed some improvements in Length of Stay in one ward, but a slight increase in others. Similarly there was a reduction recorded in non-elective readmissions from some wards, but an increase (in a small sample) in those being readmitted from the critical care unit. Other data showed a slight deterioration in the mean number of cases where the decision to admit in A&E exceeded four hours.

In a complex clinical environment, it is very difficult to show causality and attribute any of these changes directly to the introduction of Medic Bleep and consequently it has not been possible to develop any health economic evidence using robust methodology.

The staff survey highlighted the ease of use of the Medic Bleep platform, with 94% of all respondents either Completely or Somewhat Agreeing with the statement "I understand how to use Medic Bleep". The survey also highlighted the short learning curve and positive feedback was expressed regarding the overall usability. However opinions differ according to clinical discipline with nurses and AHPs being largely more favourable than senior doctors. A number of doubts were expressed about using mobile phones in front of patients, suggesting more information could be provided to patients. Feedback has also cited some connectivity and other technology issues which will likely be resolved as the implementation evolves, the product features develop and users become more familiar with the change to clinical communications. A handful of comments were expressed in the qualitative feedback regarding the overall safety and it is vital that these concerns are addressed and steps taken to minimise and ultimately eliminate this risk.

Finally, a post implementation review of the nature and volume of calls to the switchboard was not carried out, which may have provided some evidence of savings.

Medic Bleep at West Suffolk Hospital (WSH) - Evaluation and Analysis by Health Enterprise East Ltd.

Background

Ineffective communication has been described by WHO as the leading cause of unintentional patient harm and a study of analysing 2,455 sentinel events showed that communication failure responsible for over 70% of the events and increase in preventable hospital admissions[1]. Duplicate tests and delays in identification and treatment was also owned to ineffective team communication.

In a retrospective review[2] of 16,000 in-hospital deaths it was found that communication errors were the leading cause of death, a figure that was double of the errors due to inadequate clinical skill. Thus, communication among clinicians is highly important as it helps to avoid sentinel events while it was identified[3] that problematic processes and communication systems were a major contributing factor to patient safety.

Additionally, a recent study[4] estimated that 237 million medication errors occur at some point in the medication use process in England, per annum. This is the sum of the errors occurring at all stages of medication use: prescribing 16 (21.3%), transition (1.4%), dispensing (15.9%), administration (54.4%) and monitoring (6.9%). Additionally, the cost of in-hospital medication errors cost £15 million, results in extended hospital stays and contributes to >1,000 deaths.

A report on the National mobile health worker project from the Department of Health[5] stated that using mobile solutions can significantly improve productivity, efficiency, safety and assist services in providing quality care with good outcomes, including increase in productivity, (up

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[1] Royal College of Physicians, 2017, Improving teams in healthcare: Resource 3 - Team communication https://www.rcem.ac.uk//docs/External%20Guidance/ITIH%20R3%20Final.pdf

[2] Parker, J. and Coiera, E., 2000. Improving clinical communication: a view from psychology. Journal of the American Medical Informatics Association, 7(5), pp.453-461. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC79040/pdf/0070453.pdf

[3] Woods, D.M., Holl, J.L., Angst, D., Echiverri, S.C., Johnson, D., Soglin, D.F., Srinivasan, G., Barnathan, J., Amsden, L., Lamkin, L. and Weiss, K.B., 2008. Improving clinical communication and patient safety: clinician-recommended solutions. In Advances in patient safety: new directions and alternative approaches (Vol. 3: performance and tools). Agency for Healthcare Research and Quality (US). https://www.ncbi.nlm.nih.gov/books/NBK43654/

[4] Elliott, R., Camacho, E., Campbell, F., Jankovic, D., St James, M.M., Kaltenthaler, E., Wong, R., Sculpher, M. and Faria, R., 2018. Prevalence and economic burden of medication errors in the NHS in England. Rapid evidence synthesis and economic analysis of the prevalence and burden of medication error in the UK

[5] Department of Health, 2013. National mobile health worker project.

to increase in contact activity 142%), less travel time (reduction to up to 33% and increase of up to 11% in clinical activity), decrease in data duplication (up to 92% freeing up clinical time), reduction of no access visits (up to 50%), better communication for less referrals (up to 34%), and finally apparent reductions in admissions (up to 91%).

Furthermore, switching from hospital pagers to a secure text messaging system in a hospital and medical centre in the USA[6] reduced length of stay by 0.77 days (95% CI: -1.14 to -0.40).

It has also been shown[7] that the increased information flow with respect to each patient case can help to manage to prioritise the urgency of care. Clinical staff appear to be willing to use their mobile phones for in-hospital communication, research[8] found that 92.6% of the doctors possess a smartphone and that 80% of those are willing to use their mobile device for -work-related purposes.

Another study[9] developed an uncomplicated traffic light system to complement their electronic handover structure. This demonstrated improvements in time to complete the ward round (from 7.1% to 50%), prioritisation and highlighting the clinical urgency for patient review (from 15.4% to 100%) while importantly, clinician's perspective on patient safety was also improved (from 38.5% to 100%).

West Suffolk Hospital

The West Suffolk NHS Foundation Trust (WSFT) provides hospital and some community healthcare services to people in the West of Suffolk and is an associate teaching hospital of the University of Cambridge. The Trust serves a predominantly rural geographical area of approximately 600 square miles with a population of around 280,000. WSFT's main facility is West Suffolk Hospital (WSH), a busy district general hospital which provides a range of acute core services with associated inpatient and outpatient facilities. WSH has around 500 beds and 14 operating theatres. WSFT employs 3,814 staff as of March 2018 and provided services for an excess of 470,000 patients over 2017/2018.[10]

A range of nursing and therapy services are provided by community health and specialist community teams; these services are provided in patients' own homes, health clinics/centres

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[6] Patel MS et al., Change in length of stay and readmissions among hospitalized medical patients after inpatient medicine service adoption of mobile secure text messaging. J General Internal Medicine 2016; 31 (8): 863-870

[7] Déry, J., Ruiz, A., Routhier, F., Gagnon, M.P., Côté, A., Ait-Kadi, D., Bélanger, V., Deslauriers, S. and Lamontagne, M.E., 2019. Patient prioritization tools and their effectiveness in non-emergency healthcare services: a systematic review protocol. Systematic reviews, 8(1), p.78. https://systematicreviewsjournal.biomedcentral.com/articles/10.1186/s13643-019-0992-x

[8] Menon, R. and Rivett, C., 2019. Time–motion analysis examining of the impact of Medic Bleep, an instant messaging platform, versus the traditional pager: a prospective pilot study. Digital health, 5, p.2055207619831812

[9] Ah-kye, L. and Moore, M., 2015. A simple prioritisation system to improve the electronic handover. BMJ Open Quality, 4(1), pp.u205385-w4127. https://bmjopenquality.bmj.com/content/4/1/u205385.w4127

[10] WSFT Annual Report & Accounts 2017/18 https://www.wsh.nhs.uk/CMS-Documents/Trust-Publications/Annual-reports/Annual-report-2017-18.pdf

and community buildings, including a clinical assessment and prescribing service for a county wide community wheelchair service.

WSFT has been selected by NHS England as a Global Digital Exemplar (GDE) for delivering exceptional care, efficiently, through the use of world-class digital technology and information. In 2016, WSFT implemented Cerner's EHR platform, *Millennium*®, a novel electronic patient care record system, known as e-Care, as well as new vital signs monitors. The trust has also recently updated their Wi-Fi to provide high speed internet across the site to aid future digital adoption programmes at the trust.

For staff communication, the trust, has historically relied on pagers and landlines. While pagers (referred to at WSH as 'bleeps' or 'bleepers') have the advantage of not relying on Wi-Fi or a mobile signal, the communication method is one-way, in other words, the recipient is unaware who is bleeping, why, or the level of urgency.

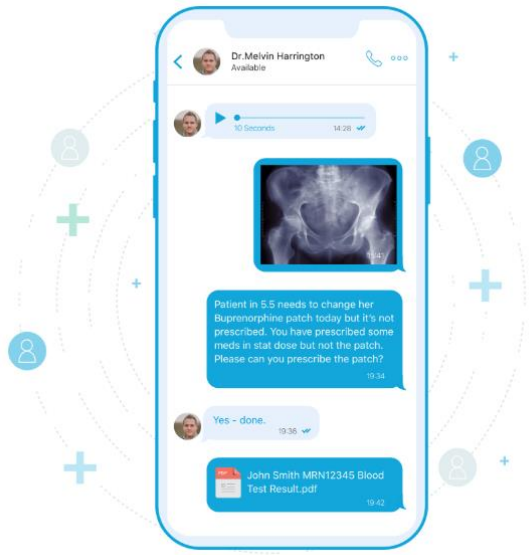
Medic Bleep

Medic Creations Ltd developed Medic Bleep, a data-compliant, secure messaging service for health care professionals (HCPs) to efficiently and effectively communicate. Following a successful pilot[11] of Medic Bleep in 2017 at WSH (181 participants), the efficacy of Medic Bleep in improving internal communication has been independently assessed and evaluated, in this hospital-wide roll out. The Medic Bleep interface is shown below.

Features of Medic Bleep include:

- Individual and group text and audio messaging
- Audio calls
- Image and file sharing
- Patient information tab
- Audit trail
- View when a message is sent, delivered and read
- View role, availability and on-call status of colleagues
- Searchable organisation directory
- Pin/fingerprint protected login
- Mobile, tablet and desktop computer access
- Broadcast messaging
- Business intelligence dashboard for trends and reporting

[11] Menon, R. and Rivett, C., 2019. Time–motion analysis examining of the impact of Medic Bleep, an instant messaging platform, versus the traditional pager: a prospective pilot study. Digital health, 5, https://doi.org/10.1177/2055207619831812



Medic Bleep interface. Image from medicbleep.com

In the pilot study[12] of Medic Bleep in 2017, doctors and nurses from the Trauma and Orthopaedic ward and Maternity ward, in collaboration with community midwives, used Medic Bleep over a period of eight days at WSH. Junior doctors and nurses were followed each day during the pilot using a Time Motion (T&M) methodology for two days prior and post the assimilation of Medic Bleep as their means of interpersonal communication. Quantitative analysis was performed to deduce the difference in mean task duration between Medic Bleep and the traditional pager. Participants also filled in a questionnaire to assess the impact of Medic Bleep on end user satisfaction.

The introduction of Medic Bleep corresponded to a reduction in mean task duration that was statistically significant ($p<0.05$) for To Take Out (TTO) and patient review. There was a significant number of minutes saved per shift as well as qualitative results indicating that Healthcare Professionals (HCPs) benefited from better work prioritization, collaboration and reduced medical errors.

In the hospital-wide roll out in 2019, Medic Bleep was implemented over an acclimatisation period during which members of staff had access to both Medic Bleep and pagers, before switching exclusively to Medic Bleep (apart from the continued use of pagers for calling 2222 for emergencies). As in the pilot, quantitative and qualitative data was gathered via a questionnaire. In addition, quantitative data was gathered from clinical IT systems, T&M investigations. The data collection and analysis were conducted independently by Health Enterprise East Ltd (HEE).

[12] Menon & Rivett, (2019) Time-motion analysis examining of the impact of Medic Bleep, an instant messaging platform, versus the traditional pager: a prospective pilot study. Digit Health. 2019 Feb 20;5:2055207619831812. doi: 10.1177/2055207619831812

Pre-requisites for Medic Bleep implementation:

Many of the requirements for successful roll-out Medic Bleep were infrastructure related and policy obligations, which will be applicable for any digital innovation or adoption within a trust. The following pre-requisites were identified:

- Wi-Fi hospital-wide (WSH updated their Wi-Fi in 2018/19- wireless G, N & AC with speeds of 1GB/ms, 593 nodes (50 users/node). The Wi-Fi is compliant with ISO 27001, (the international information security standard)
- WSH implemented a bring-your-own device policy[13]
- Charging stations were made available throughout the hospital and additional devices for staff without a smartphone, or for those who are unwilling to use their own
- Implementation team (this includes staff to communicate to the hospital community the details and logistics of roll-out, patient liaison etc.)
- Project management team (to ensure the abovementioned are achieved prior to implementation, to oversee implementation, facilitate drop-in sessions, FAQs etc. and to ensure roll-out does not disrupt day to day running of the hospital)

Implementation of Medic Bleep

There were considerable delays in the roll out of Medic Bleep at WSH. This was principally due to delays with the Wi-Fi upgrade to the hospital, which were out of the control of the operations team responsible for Medic Bleep. The Wi-Fi upgrade was introduced in order to facilitate better wireless connectivity as well as to upgrade cyber security protocols. As well as upgrading the Wi-Fi on site, a critical job of the technical team was to identify any 'black-spots' in the hospital for Wi-Fi signal, as a strong internet signal is essential for smooth operation of Medic Bleep throughout the entire site.

Ultimately, 420 access points were installed across the trust in order to provide the coverage required to support Real Time Location Service across the trust.

Whilst the delays to the launch of Medic Bleep were unforeseen, they provided additional time for the operations team to provide extra communication pieces to members of staff about Medic Bleep. This included members of Medic Bleep and WSH 'floor-walking' and answering any questions from staff. All staff were given crib sheets and log in details during the Go Live period.

Medic Bleep was rolled out in a 'soft-launch' at WSH. Bleepers were gradually removed from staff over a period of 7-8 weeks (Medic bleep went live on 25th of June 2019), with essential bleeps kept for crash teams and rapid response teams (calls to 2222). Consequently, in preparation for bleep removal, 21 emergency bleep groups were identified, such as those

[13] Trust Policy & Procedure PP(14) 314 https://www.wsh.nhs.uk/CMS-Documents/Trust-policies/301-350/PP18314BringYourOwnDevice.pdf

required to respond to critical patient incidents, groups around site management and operational groups, and 120 bleeps were incorporated into these groups.

The staff were given SOPs, depending on their role, on how to use Medic Bleep when entering the hospital i.e. on call, their role etc, and how they should log out when they would not be using Medic Bleep after they finish their shift.

Evaluation Methodology

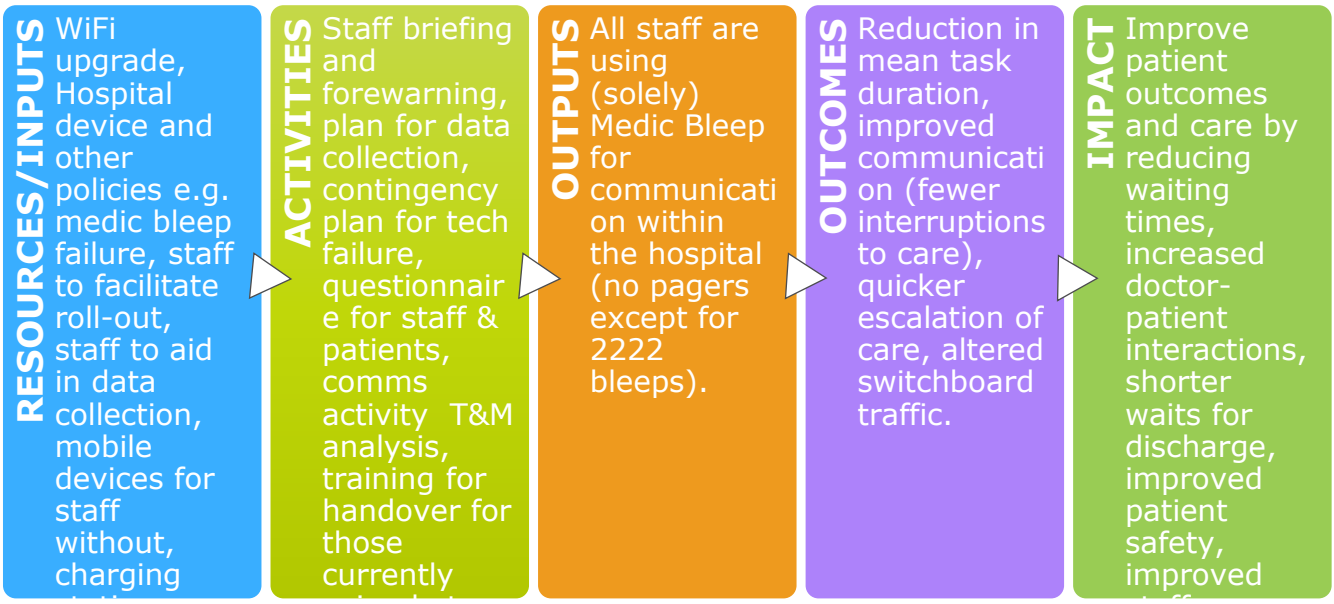
The Logic Model was used to inform discussion on the potential benefits of Medic Bleep and metrics which could be collected to demonstrate those benefits. These benefits and metrics were discussed and agreed with representatives from all key stakeholders in the implementation and evaluation process (WSH, Eastern AHSN, Medic Creations Ltd. and Health Enterprise East Ltd.) in Nov 2018.

Benefits and Metrics

Using the logic model (Appendix A) key metrics were identified and methods for measuring them, both pre- and post- implementation of Medic Bleep were explored and discussed with the key stakeholders. Metrics were also classified according to their ability to provide:

- cash releasing benefits
- financial, but non-cash releasing benefits
- non-financial but quantifiable benefits
- qualitative, societal benefits

Logic Model Summary



Theme 1: TRAINING & BUSINESS CHANGE

Developing a sustainable training plan for staff. Developing Standard Operating Procedures (SOPs) and redesigned processes, signed off and underpinning training and comms. Maintaining a clear path to engage and inform staff.

Theme 2: INFRASTRUCTURE

Ensuring all infrastructure requirements are ready for launching Medic Bleep.

Theme 3: TECHNOLOGY

Ensuring all technical requirements are ready for launching Medic Bleep.

Theme 4: BUSINESS CONTINUITY

Ensuring clarity of what would happen if Medic Bleep became unavailable.

Theme 5: POLICY & CLINICAL SAFETY

Implementing a robust bring-your-own device policy. Developing the statutory clinical safety case, while using it to engage the organization.

Theme 6: SUSTAINABILITY

Implementing a robust and sustainable system for SOPs, reporting and technical support mechanisms for WSH.

Theme 7: DATA COLLECTION & EVALUATION*

Evaluating the project with clear metrics, agreed upon by the various stakeholders.

Logic model impact-to-input deductions using design thinking methodology

**Data collection & Evaluation is specific to the roll-out at WSH and may not be appropriate nor applicable to other Trusts when using this model for implementation*

In addition, each metric was assessed for whether any changes could be directly attributable to Medic Bleep or not.

Table 1 below summarises the results from the stakeholder discussion in Nov 2018, which highlights the key potential metrics and the source of the data for each. The selection of metrics was in part based on discussion as well as insights from literature on the effect of

improved communications and the impact on improved Length of Stay (LoS)[14], prioritising urgency of care[15], saving clinicians time[16] and patient safety[17]

[14] Patel MS et al., Change in length of stay and readmissions among hospitalized medical patients after inpatient medicine service adoption of mobile secure text messaging. J General Internal Medicine 2016; 31 (8): 863-870

[15] Déry, J., Ruiz, A., Routhier, F., Gagnon, M.P., Côté, A., Ait-Kadi, D., Bélanger, V., Deslauriers, S. and Lamontagne, M.E., 2019. Patient prioritization tools and their effectiveness in non-emergency healthcare services: a systematic review protocol. Systematic reviews, 8(1), p.78. https://systematicreviewsjournal.biomedcentral.com/articles/10.1186/s13643-019-0992-x

[16] Menon & Rivett, (2019) Time-motion analysis examining of the impact of Medic Bleep, an instant messaging platform, versus the traditional pager: a prospective pilot study. Digit Health. 2019 Feb 20;5:2055207619831812. doi: 10.1177/2055207619831812

[17] Ah-kye, L. and Moore, M., 2015. A simple prioritisation system to improve the electronic handover. BMJ Open Quality, 4(1), pp.u205385-w4127. https://bmjopenquality.bmj.com/content/4/1/u205385.w4127

TABLE 1 – POTENTIAL BENEFITS AND METRICS FOR THE EVALUATION OF MEDIC BLEEP AT WSH

Potential Benefit	Source of Metric	Benefit classification	Perceived as being directly attributable to Medic Bleep?
Communication efficiency in carrying out clinical tasks	T&M & E-care	Non cash-releasing	Y
Reduced Length of Stay	E-care	Non cash-releasing	N
More efficient transfer of care (incl. TTOs)	T&M / E-care	Non cash-releasing	N
Quality of Service (from patient perspective)	National Annual Patient Survey	Non-financial; Quality Improvement	N
Quality of working life	Survey	Quality Improvement	N
Reduction in temporary staff (agency/bank)	WSH	Cash-releasing	N
Fewer cancelled operations / more elective surgeries	E-care	Cash-releasing	N
Fewer Readmissions	E-care	Non cash-releasing	N
Fewer incidents/ complaints surrounding communication	DATIX	Non-financial; Quality Improvement	Y
Shorter admission times from A&E	E-care	Non cash-releasing	N
Reduced traffic to switchboard	Switchboard	Non cash-releasing	Y

Data Collection – Baseline & Post Implementation

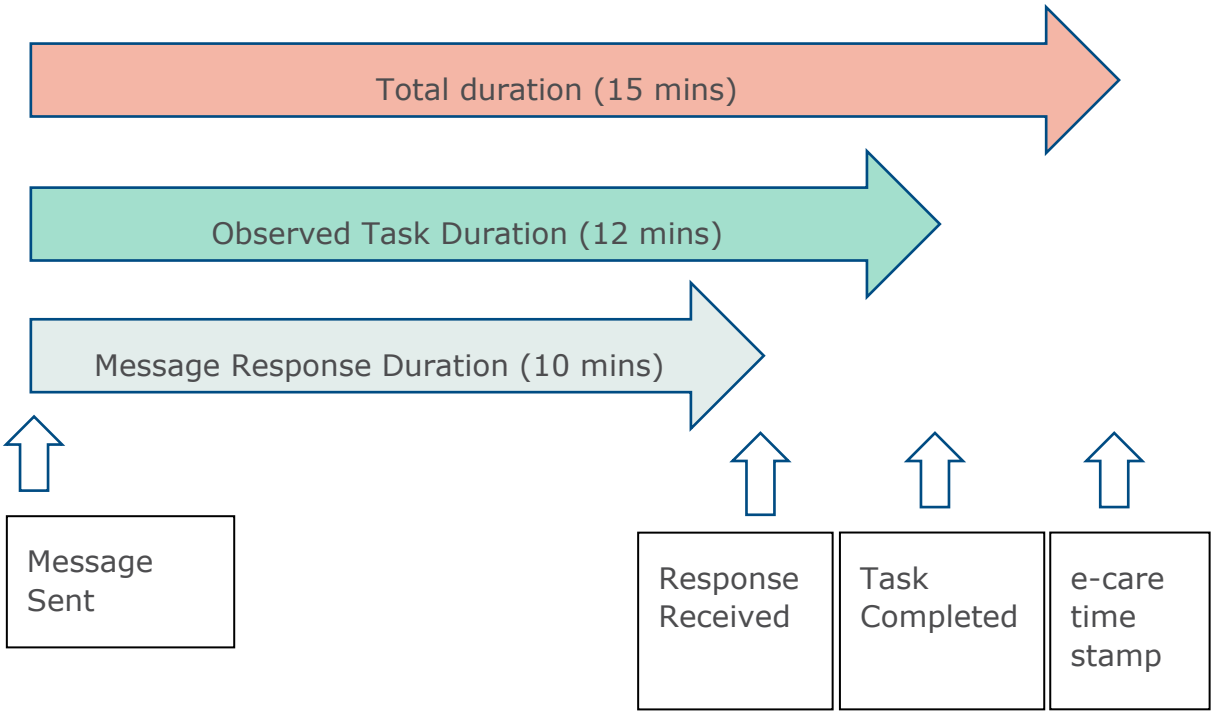
In order to quantify any changes and improvements in the recorded metrics, baseline measurements were recorded and compared with post implementation data. Both baseline and post implementation data were collected from carrying out T&M data collection, analysis of calls to switchboard, staff survey and collecting data from clinical IT systems, including e-care.

T&M Data Collection

In late 2018/ early 2019 it was assumed that the implementation of Medic Bleep would take place in March / April 2019. Consequently, baseline T&M data was collected in Jan and Feb 2019. Discussions with key stakeholders (WSH, Eastern AHSN, Medic Creations Ltd. and HEE Ltd.) identified key operational areas of the hospital where Medic Bleep may have the biggest impact on both patient flow and patient discharge. The discussion concluded that shadowing the Emergency Department (ED) coordinator and the screening pharmacists would provide that insight and offer an alternative assessment of the potential impact of Medic Bleep compared to the pilot, which shadowed junior doctors and nurses.

Over two days in each department (ED & pharmacy), ED coordinators and screening pharmacists were observed in their usual day-to-day work and all non F2F communications between staff were logged. The time at which any communication was sent or received was noted, along with the mode of communication (landline, bleep, Medic Bleep etc.) and the time a response to corresponding response was received was also logged (to provide an overall **message response duration**). In addition, the time the action was observed to be completed was recorded (to provide an **observed task duration**). Finally, for each communication and task, the patient's MRN was also recorded so that time stamp data in e-care could subsequently be examined in order to assess when the task was completed so that the **total duration** could also be reviewed (illustrated below). This time and motion activity was repeated post implementation of Medic Bleep in Sept 2019.

An example of the T&M metrics and data sheet are shown below (Table 2), where the message response time was 10 minutes, the observed task duration was 12 minutes and the total duration, from initial message to time stamp in e-care was 15 minutes. This is illustrated in **Error! Reference source not found.**.



Time Message Sent	Bleep/call	Reason/task	MRN	Response to message	Task completed (observed)	Relevant time stamp from e-care
09:00	Call to Bleep	Check TTO with Consultant	XXXXX	09:10	09:12	09:15

Switchboard Data Collection

Another department which had been identified as being potentially affected by the change in communications was the main switchboard. The main switchboard handle both internal and external calls. The data collection involved the collection of the reasons for the internal and external incoming calls, which were self recorded and tallied by switchboard operators. Baseline data was gathered over a two week period in January and February 2019 and the intention was to repeat this data collection post implementation, together with the reasons for calls received, as well as the total volume of calls compared to see how the introduction of Medic Bleep at WSH altered the volume of calls coming through switchboard and the reason for those calls.

Clinical data from IT systems, including e-care

Data was requested and received from the Information Team at WSH, the data requested initially included monthly averages over the period Jul 2018 to Oct 2019. This was to allow direct comparison of equivalent periods pre-implementation (Jul–Oct 2018) and post

implementation (Jul–Oct 2019) of Medic Bleep, as well as reviewing the intervening months, which help to illustrate and indicate data trends.

The data requested included monthly averages of the following parameters:

- Length of Stay data (LoS)
- Changes in/Efficiency of Delayed Transfer of Care (MSitDT)
- Changes in/Efficiency of discharge times – Pre & Post 11am
- Number of cancelled operations
- Number of elective surgeries
- Number of readmissions (<30 days)
- Data on bed availability in both general & acute wards
- Number of cases where Decision to Admit from ED is greater than four hours
- ED six hour breaches (from Arrival to Departure)
- Number of temporary / agency / bank staff engaged.

Staff Survey

A staff survey, designed to gather feedback and usage of the previous bleeper method was distributed by WSH in spring 2019. The number of responses was low (n=11) and requests for a reminder to redistribute the survey were turned down by the Trust due to other priorities.

A second staff survey was distributed by WSH in Nov 2019. The aim of this questionnaire was to collect both quantitative and qualitative responses and included questions comparing Medic Bleep and comparisons with the bleeper messaging system (see Appendix B).

The survey was designed to capture both the perceived usefulness and perceived ease of use of Medic Bleep, both of which combine to boost attitudes and intentions regarding usage and technology acceptance[18].

Additional Data

Datix data

Datix data was also requested from the periods before and after the implementation of Medic Bleep was also requested from WSH, which would potentially indicate any change in the number of reported clinical incidents and/or complaints regarding communications.

CQC Patient Surveys

Finally, publicly available patient survey data[19] was reviewed for any specific feedback pertaining to communication between clinicians.

[18] Davis, F. D.; Bagozzi, R. P.; Warshaw, P. R. (1989), "User acceptance of computer technology: A comparison of two theoretical models", *Management Science*, **35** (8): 982–1003, doi:10.1287/mnsc.35.8.982

[19] The Care Quality Commission https://www.cqc.org.uk/provider/RGR/surveys

Evaluation Results & Discussion

T&M Data Collection

Baseline time and motion data collection was undertaken in January/February 2019 and repeated in Sept 2019. In order to be cognisant of seasonal differences, including the effect of winter pressures, qualitative observations of occasions when the hospital was at its peak activity were recorded. In addition, data has been requested from the Information Team at WSH to get comparable data on Emergency Department (ED) capacity (total attendance at ED and average patient journey time) on the specific dates the ED time and motion studies were carried out.

Alongside the quantitative data captured by the T&M, additional qualitative feedback was received by staff in pharmacy and the ED, and observations were noted about the impact of both bleepers and Medic Bleep on communications within WSH. These are detailed in the qualitative feedback section, below.

Pharmacy

Figure 1-4 below compare the Message Response Times, Observed Task Durations and Total Task Durations (with the task end point being collected from e-care) observed in pharmacy both pre-implementation (with pagers) and post implementation of Medic Bleep. The data was captured from time and motion analysis of screening pharmacists.

When shadowing screening pharmacists both pre and post implementation of Medic Bleep, there was little difference in **message response times**, with 87% of responses received in 2 minutes pre-implementation and 85% post implementation (Figure 1).

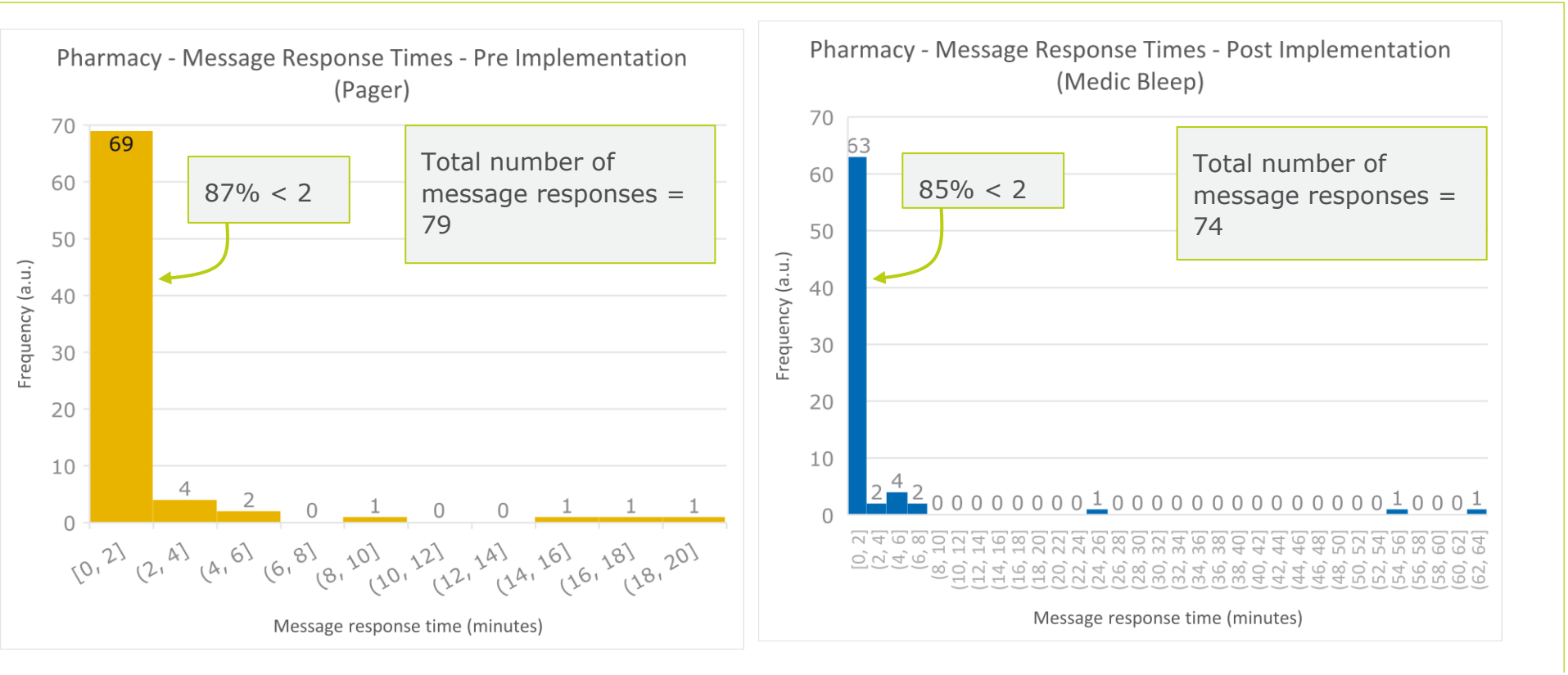
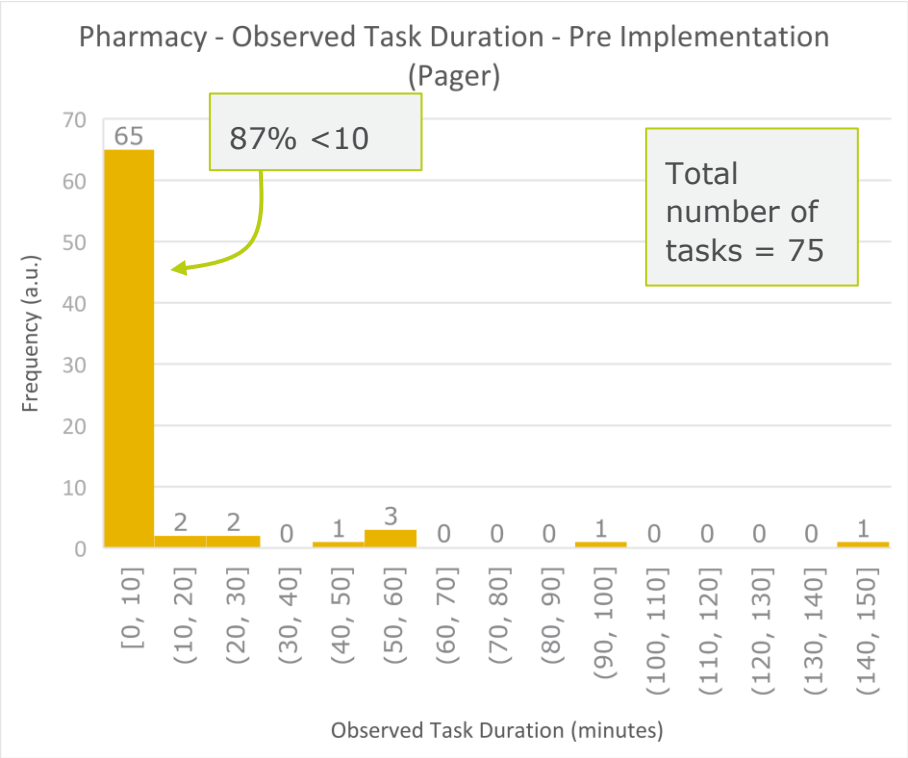


FIGURE 1 COMPARISON OF MESSAGE RESPONSE TIMES (IN MINS) PRE AND POST IMPLEMENTATION OF MEDIC BLEEP OBSERVED DURING TIME & MOTION STUDIES OF SCREENING PHARMACISTSI WOULD

There was an improvement in the **observed task duration** in pharmacy, with 94% of tasks with Medic Bleep having an observed completion time of under 10 minutes compared to 87% of tasks under 10 minutes with the pager (Figure 2). This is may be because staff were able to triage messages and act accordingly by prioritising tasks based on urgency. Whereas with bleepers, the only way to determine the subject of message was to find a landline (often located across the ward, or sometimes occupied) and call the source number (which may also be occupied). However, it is also conceivable that this difference could be attributed to winter pressures causing additional demand on staff in the pre-implementation analysis. Statistical comparison (two tailed t-test) of the mean observed task duration in both scenarios did not show any significant differences in the means at 95% confidence levels. There was however a statistically significant difference in mean observed task durations at 90% confidence levels, although it is difficult to directly attribute this change to the introduction of Medic Bleep.



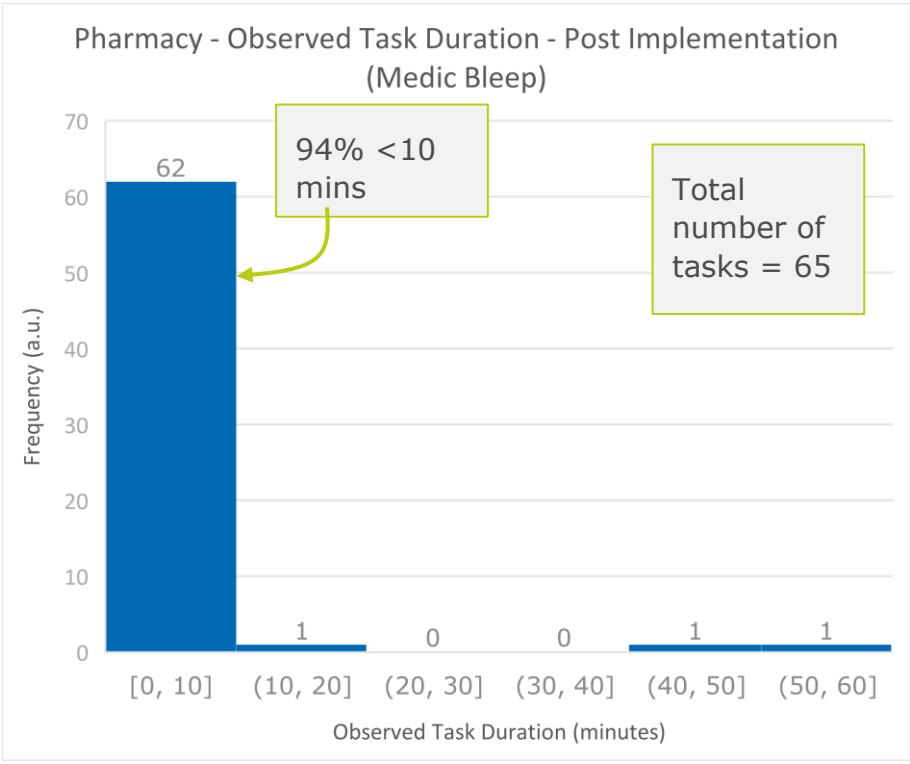


FIGURE 2 COMPARISON OF OBSERVED TASK DURATION (IN MINS) PRE AND POST IMPLEMENTATION OF MEDIC BLEEP DURING TIME & MOTION STUDIES OF SCREENING PHARMACISTS. END POINT OF TASK RECORDED FROM OBSERVATION IN TIME & MOTION STUDY.

This improvement in observed task duration did however not necessarily result in faster task completion observed in e-care. There was relatively little difference in the **total task durations**, representing the period between the initial message being sent and the time stamp recorded in e-care to indicate that the corresponding task had been completed (typically medication being dispensed). 36% of total task durations were under 30 minutes following the implementation of Medic Bleep, compared to 29% of tasks with pager, yet the proportion of tasks completed after 90 minutes were identical (71%) in both scenarios (Figure 3). Furthermore, there was no statistical difference between the mean task durations of each scenario at either 90 or 95% confidence limits.

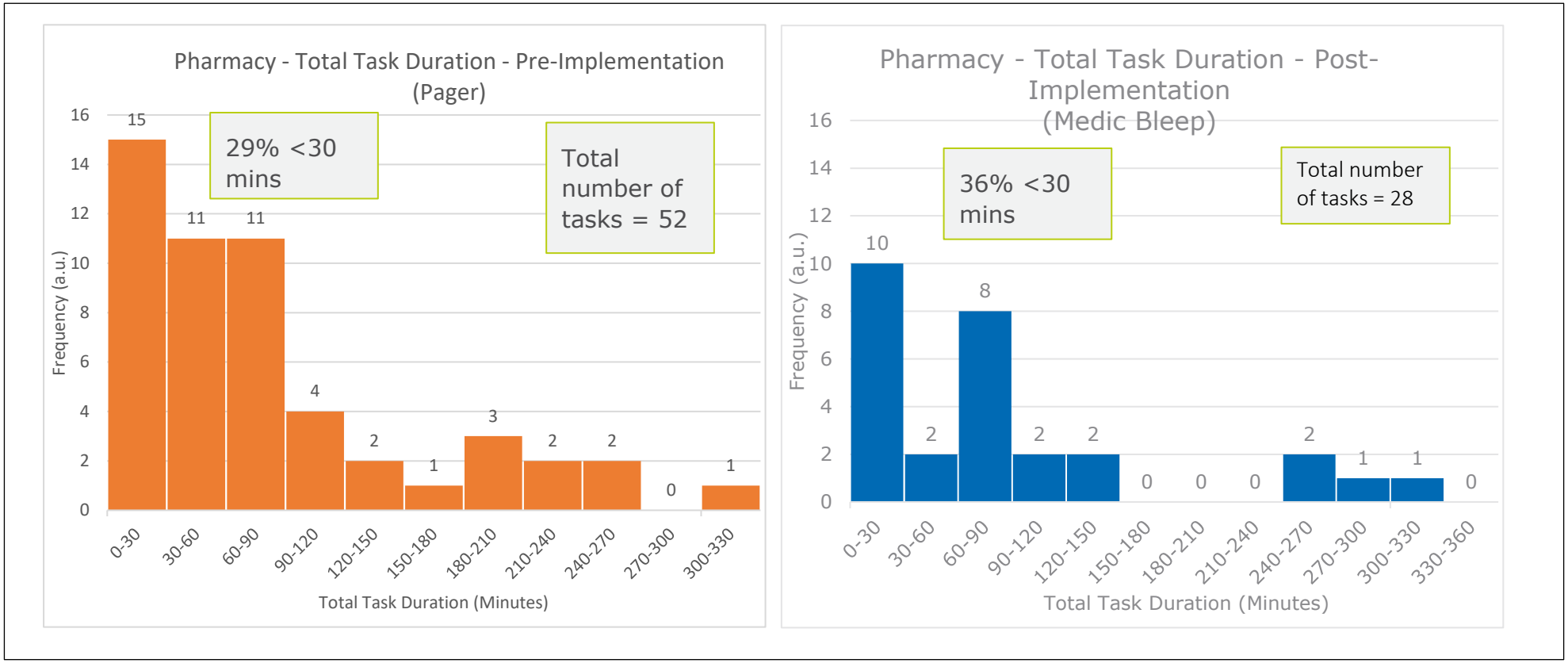


FIGURE 4 COMPARISON OF TOTAL TASK DURATION (IN MINS) PRE AND POST IMPLEMENTATION OF MEDIC BLEEP DURING TIME & MOTION STUDIES OF SCREENING PHARMACISTS. END POINT OF TASK RECORDED FROM E-CARE.

ED

Figure 5-7 compare the Message Response Times, Observed Task Durations and Total Task Durations (with the task end point being collected from e-care) observed in ED both pre-implementation (with pagers) and post implementation of Medic Bleep. The data was captured from time and motion analysis of an ED coordinator.

It is important to note that the pre-implementation time and motion data collection took place in Feb 2019, which was during peak winter pressures for WSH. The time and motion exercise was repeated, post implementation of Medic Bleep, in Sept 2019. Clearly, by comparing data from different seasons, there could have been different demands on hospital resources and staff during these different seasons. However, data provided by WSH (Table 3) shows that, on the days the T&M observations were carried out, there were actually fewer ED attendances in the February T&M observation period, although the average patient journey time was a little higher. Bed availability was slightly lower in the February T&M period compared to September but the numbers are comparable.

TABLE 3 COMPARISON OF ED CAPACITY AND BED AVAILABILITY ON THE TWO TIME & MOTION PERIODS – FEB & SEPT 2019

	Total ED attendances on T&M observation days [20]	Average patient journey time (mins) on T&M observation days	Mean proportion of beds occupied on T&M observation days
February T&M	389	363	98%
September T&M	410	316	94%

There was contrasting outcomes from the analysis of **message response times**, when shadowing the ED coordinator both pre and post implementation of Medic Bleep (Figure 5). Prior to Medic Bleep, the majority (74%) of all messages in E&D were responded to within 2 minutes. After the introduction of Medic Bleep, the proportion of messages responded to was reduced (55%), potentially indicating that responses to

[20] Due to a change of reporting at WSH in May 2019, February ED attendances show the number of patients entering ED on those days, but September attendances show the number of patients leaving ED on that day

messages were not as efficient after implementation as before. In contrast, after 10 minutes, 82% of all messages in E&D were responded to within 10 minutes while following the introduction of Medic bleep, this proportion increased to 90%. It is difficult to directly attribute this change to the introduction of Medic Bleep, indeed there was no statistical difference between the mean response times pre and post implementation of Medic Bleep at either 90 or 95% confidence limits.

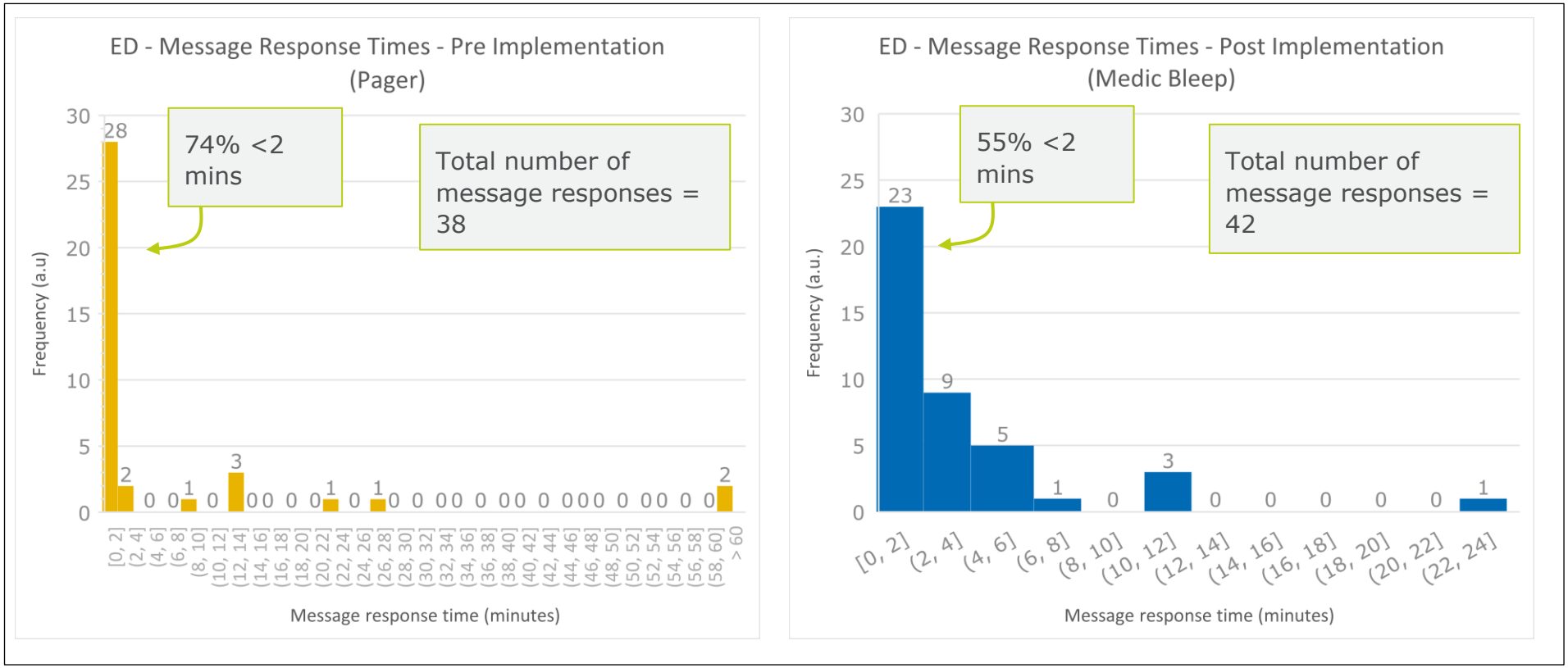


FIGURE 5 COMPARISON OF MESSAGE RESPONSE TIMES (IN MINS) PRE AND POST IMPLEMENTATION OF MEDIC BLEEP OBSERVED DURING TIME & MOTION STUDIES OF ED CO-ORDINATOR

The time taken to complete the associated task in ED (**observed task duration**) was not improved in the post- implementation period, with 24% of tasks being completed within 10 minutes of the initial message/call , compared to 33% pre-implementation of Medic Bleep (Figure 6). However, a greater improvement was observed when considering the time taken to complete the associated task within 60 minutes, with an improvement post-implementation with 80% (compared to 67% pre- Medic Bleep), although the differences were not statistically significant. As observed in pharmacy, this may be due to the ability of staff to be able to instantly view and see the query or task and to be able to prioritise tasks based on the urgency of the message in Medic Bleep, although feedback from the staff survey indicates that Medic Bleep is not significantly helping staff to prioritise workload (Figure 40). However, it is possible that this difference could be in part attributed to winter pressures causing additional demand on staff in the pre-implementation analysis, as bed availability was more challenging in the Feb T&M period compared to Sept and the majority of communication was with the bed manager.

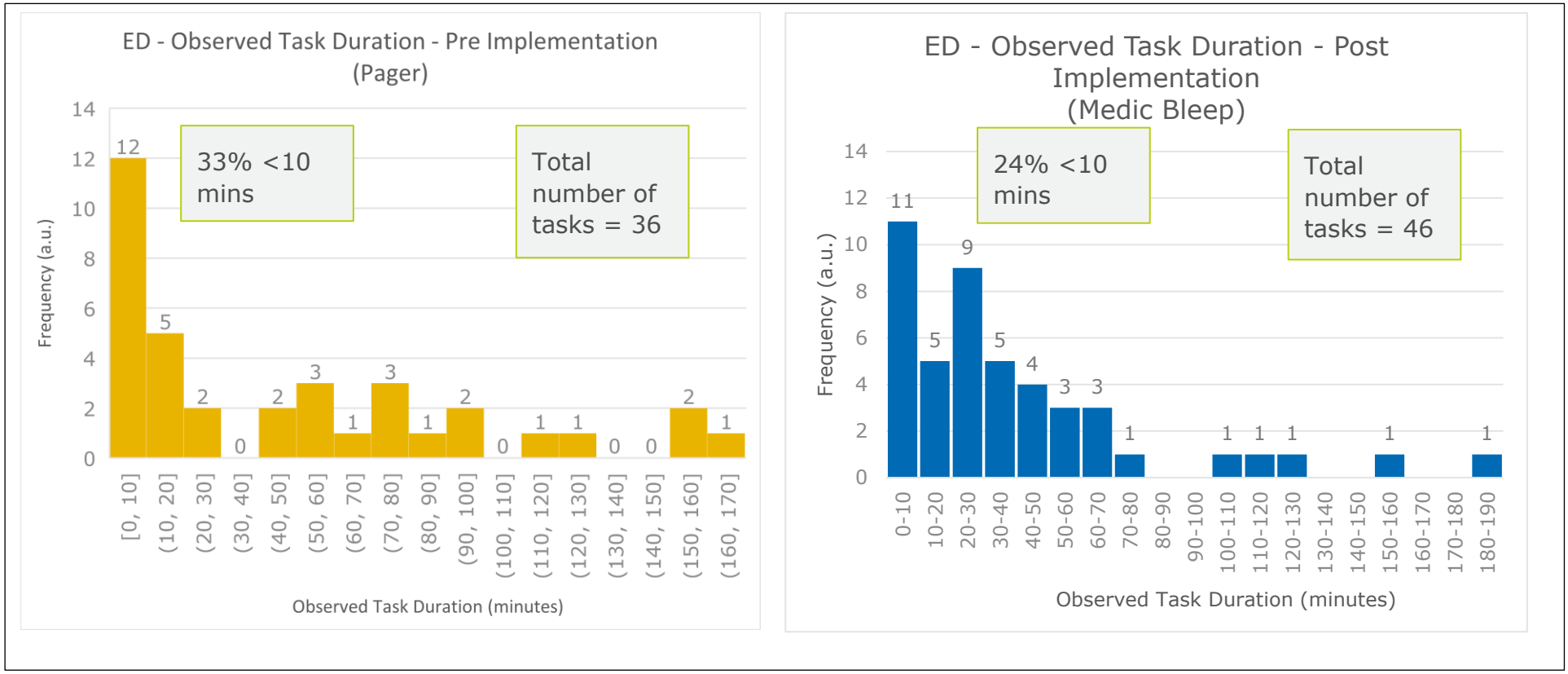


FIGURE 6 COMPARISON OF OBSERVED TASK DURATION (IN MINS) PRE AND POST IMPLEMENTATION OF MEDIC BLEEP DURING TIME & MOTION STUDIES OF ED CO-ORDINATOR. END POINT OF TASK RECORDED FROM OBSERVATION IN TIME & MOTION STUDY.

When comparing the **total task durations** in ED, there was little difference in between total durations after 10 minutes (4% of responses pre-implementation compared to 6% following the introduction of Medic Bleep). However, after 60 minutes, 69% of associated tasks were shown as completed with Medic Bleep, compared to only 44% pre-implementation (Figure 7). However, there was no statistical difference between the mean total task durations pre and post implementation of Medic Bleep at either 90 or 95% confidence limits.

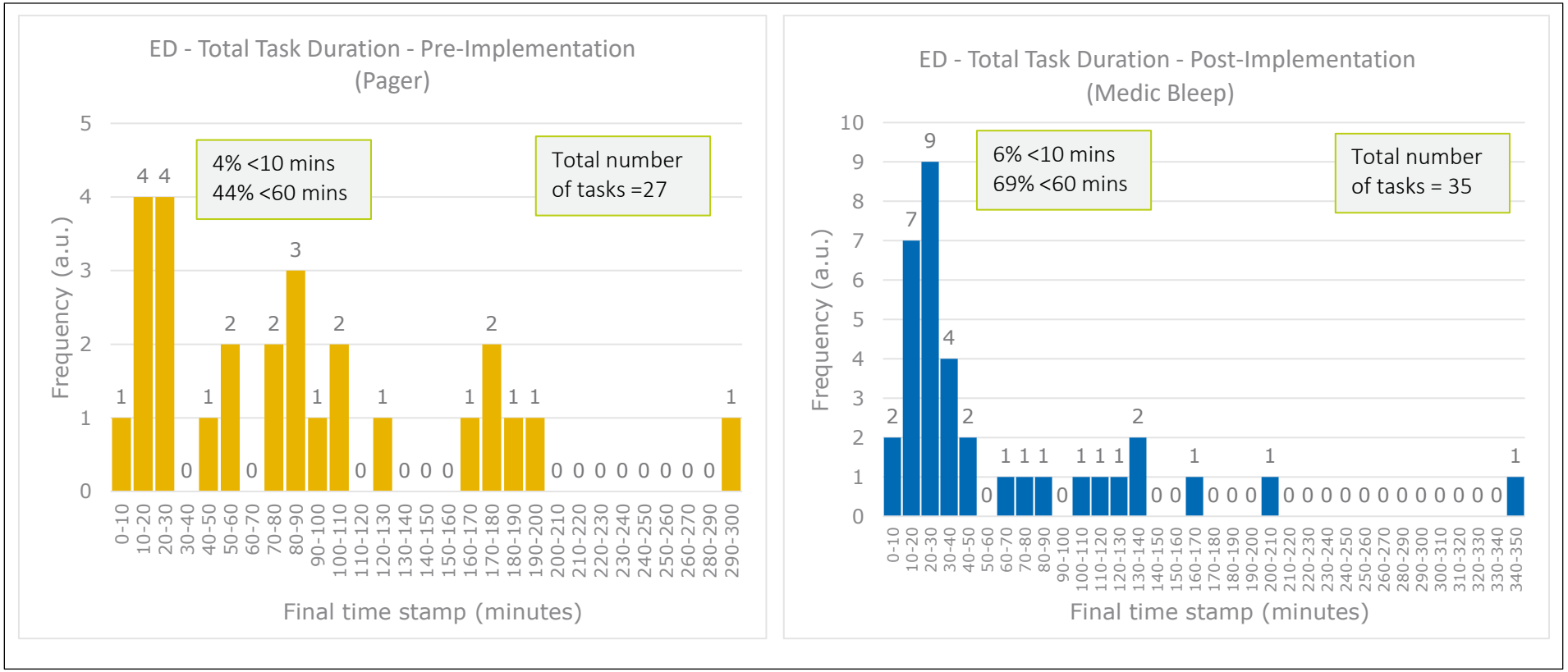


FIGURE 7 COMPARISON OF TOTAL TASK DURATION (IN MINS) PRE AND POST IMPLEMENTATION OF MEDIC BLEEP DURING TIME & MOTION STUDIES OF ED CO-ORDINATOR. END POINT OF TASK RECORDED FROM E-CARE.

It should also be noted that best practice in time and motion studies should not only aim to record before and after data in similar scenarios, such as the same day of the week and season, but should also, ideally shadow the same individuals both pre and post intervention.

In pharmacy, there were a range of screening pharmacists shadowed. Pre-Medic Bleep, a total of eleven individuals were shadowed for various periods across two days, with some repetition of individuals across both days. Following the roll out of Medic Bleep, seven screening pharmacists were shadowed across two days. Four of these individuals had also been shadowed in the pre-implementation phase. This mixture of individuals and repetition across the two study periods should help to eliminate any bias from not shadowing the exact same cohort.

In ED, the same ED co-ordinator was shadowed for two days pre roll out of Medic Bleep. The intention had been to shadow the same individual for two post roll out, although unfortunately, the individual concerned was on maternity leave in September 2019. Consequently, a colleague was shadowed for two days.

Switchboard Data

The following data was self recorded by switchboard operators over a two-week period in January and February 2019, to identify and collate the reasons for incoming calls as a baseline prior to the introduction of Medic Bleep.

The baseline data collection (*Figure 8*) revealed that a significant proportion (57%) of internal incoming calls to switchboard (285 calls over a 2-week period) were associated with bleepers, or to be connected with somebody internally; either a member of staff calling switchboard to bleep another member of staff, or calling to ask switchboard for a member of staff's bleep number or to ask who is on call. The introduction of Medic Bleep would potentially reduce or eliminate the bulk of these calls, since users can directly locate colleagues and have sight of who is on call.

Additionally, 448 calls from external sources were asking switchboard to send a bleep to a member of staff. It was anticipated that calls such as these could also be avoided, or at least dramatically reduced, with the introduction of Medic Bleep.

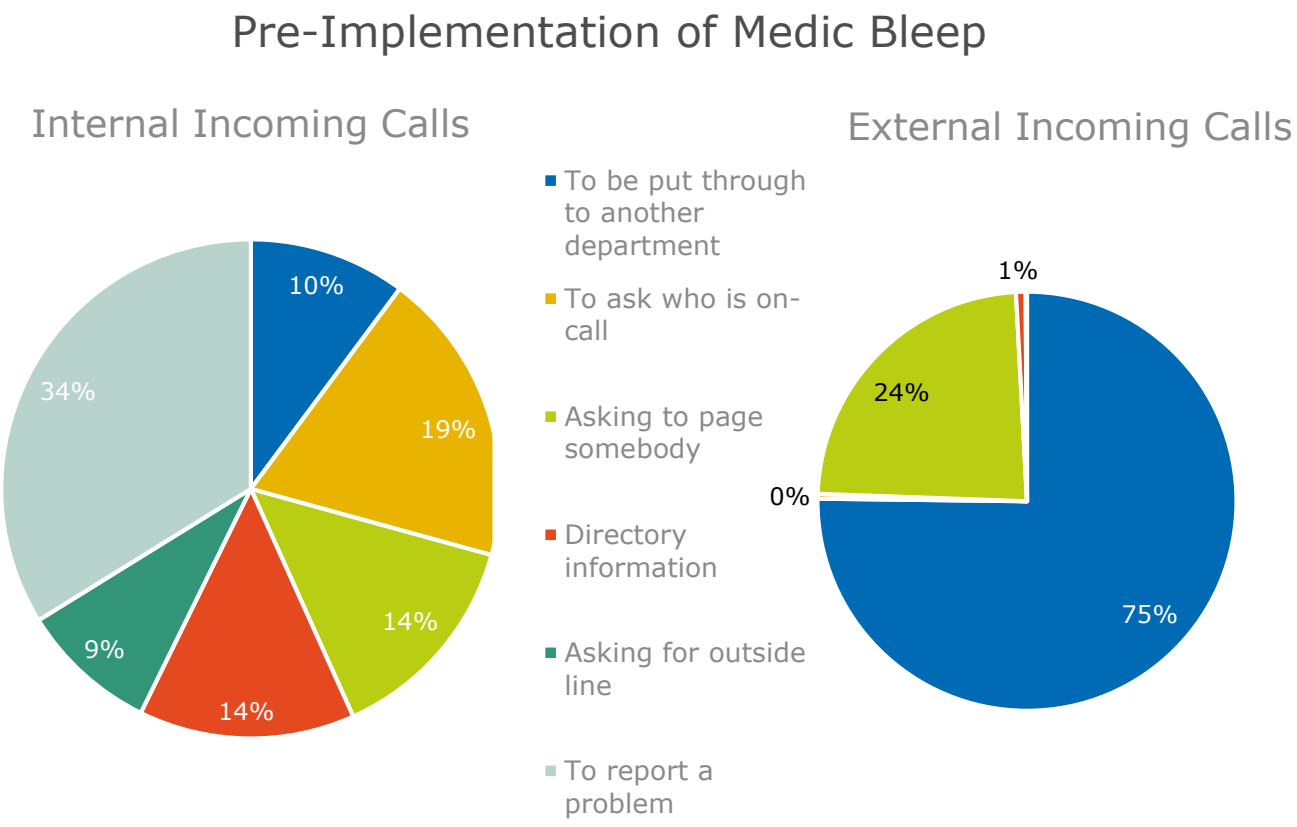


FIGURE 8 LEFT HAND SIDE - ALL RECORDED INTERNAL INCOMING CALLS OVER A PERIOD OF 2 WEEKS AT WSH (JANUARY 2019) AND THE REASON FOR THE CALL (TOTAL NUMBER OF CALLS: 550. RIGHT HAND SIDE - ALL RECORDED EXTERNAL INCOMING CALLS OVER A PERIOD OF 2 WEEKS AT WSH (JANUARY 2019) AND THE REASON FOR THE CALL (TOTAL NUMBER OF CALLS: 1899)

Following the roll out of Medic Bleep, to date, no follow up data has been provided by WSH to assess whether the nature or volume of calls has changed since the introduction of Medic Bleep. This data collection and analysis would have particularly beneficial since any change could be potentially be directly attributed to the roll out and usage of Medic Bleep.

As a learning point, in future evaluations, the switchboard data should be recorded and collected by an independent data collector, rather than relying on the Trust to record and pass on this data, since it is conceivable that using switchboard operators as data collectors introduces significant bias, since they may feel that their job security is at risk.

Clinical Data from IT systems

The data collected from the Information Team at WSH included:

- Length of Stay data (LoS)
- Changes in/Efficiency of Delayed Transfer of Care (MSitDT)
- Changes in/Efficiency of TTO times – Pre & Post 11am
- Number of cancelled operations
- Number of elective surgeries
- Number of readmissions (<30 days)
- Data on bed availability in both general & acute wards
- Number of cases where decision to admit from ED is greater than four hours
- ED six hour breaches (from Arrival to Departure)
- Number of temporary / agency / bank staff engaged.

Data was received over the period Jul 2018 to Oct 2019 to allow direct comparison of a baseline, pre-implementation, period (Jul to Oct 2018) and a post implementation period (Jul to Oct 2019). Comparing equivalent months helped to avoid any seasonality differences in the metrics.

Average Length of Stay

Over the period Jul - Oct 2018 compared to the same months in 2019, there was a statistically significant (at 95% confidence levels) decrease in the mean LoS in Ward G5 in the post implementation period (249.2 hrs compared to 203.4 hours).

In contrast, over the same period, there was a statistically significant *increase* in mean LoS in both Ward F6 (72.8 hrs to 92.1 hrs) and Ward F8 (13.1 hours to 224.9 hours) – see Figure 9. However, in Ward F8, there was a substantial change in mean LoS recorded between Nov and Dec 2018 which is skewing the data in the comparison between Jul-Oct 2018 and Jul-Oct 2019. This increase in LoS is due to the new AAU ward opening from November 2018, whereas prior to this, the AAU beds were situated on ward F8.

Similarly, there was an increase in the mean LoS in Outpatients DC, with the mean number of hours 1.2 compared to 2.6 in the post roll out phase (Jul – Oct 2019). Other wards showed no statistically significant differences between the mean LoS.

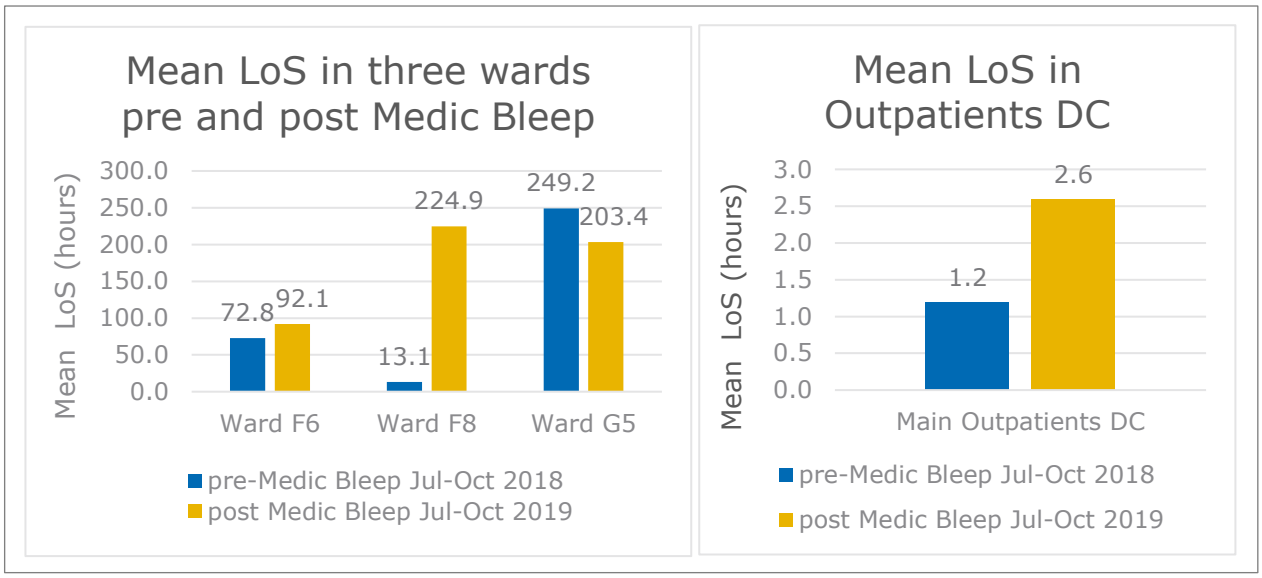


FIGURE 9 COMPARISON OF LENGTH OF STAY PRE AND POST IMPLEMENTATION OF MEDIC BLEEP IN WARDS WHERE THERE WAS A STATISTICALLY SIGNIFICANT DIFFERENCE BETWEEN THE PRE AND POST IMPLEMENTATION PERIODS.

The longer term trends in LoS for each of these wards is discussed below.

For Ward F6, the longer term mean LoS over the period Jul 2018 to Jun 2019 (just before implementation), was 81.6 hours which is less than the mean LoS recorded post roll out (92.1 hours). The trend in the months leading up to and post implementation of Medic Bleep are depicted in Figure 10.

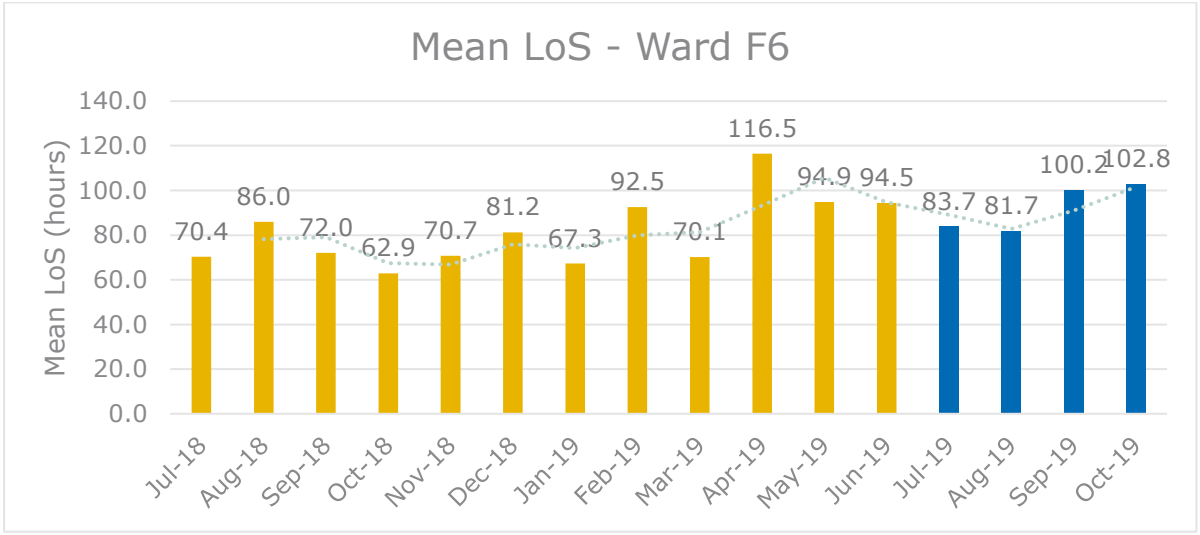


FIGURE 10 COMPARISON OF THE MEAN LOS IN WARD F6 PER MONTH OVER THE PRE-IMPLEMENTATION PERIOD JUL 2018-JUN 2019 (ORANGE) AND POST-IMPLEMENTATION PERIOD JUL-OCT 2019 (BLUE), TOGETHER WITH THE MOVING AVERAGE TRENDLINE OVER THIS PERIOD.

In Ward G5, the decline in LoS from Jul 2019 onwards compares favourably with the pre-implementation trend. The longer term mean LoS from July 2018 to Jun 2019 was 266.5 hours while the mean LoS in ward G5 was 203.4 hours in the four months following roll out (Figure 11).

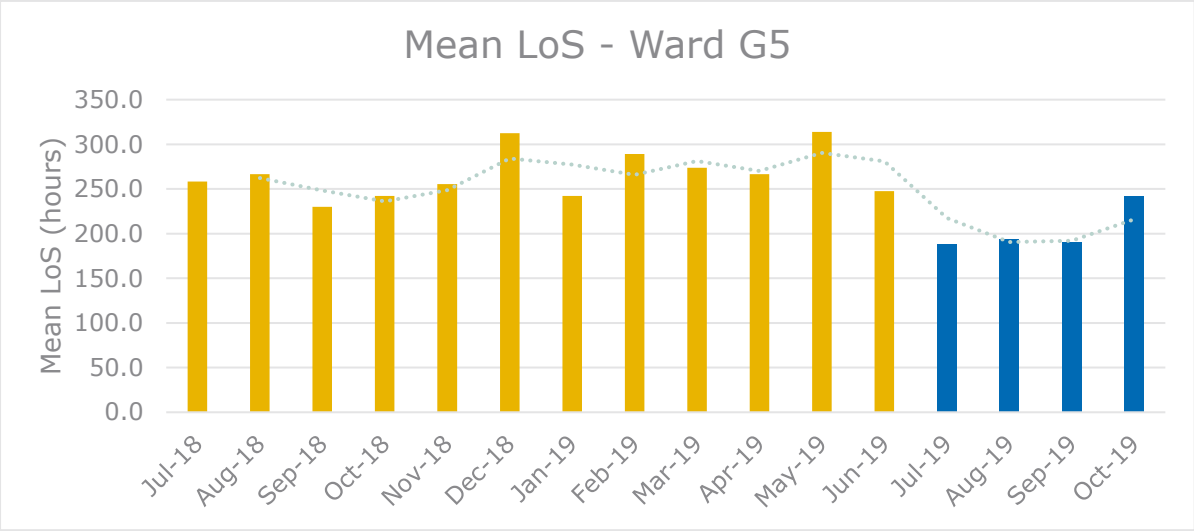


FIGURE 11 COMPARISON OF THE MEAN LOS IN WARD G5 PER MONTH OVER THE PRE-IMPLEMENTATION PERIOD JUL 2018-JUN 2019 (ORANGE) AND POST-IMPLEMENTATION PERIOD JUL-OCT 2019 (BLUE), TOGETHER WITH THE MOVING AVERAGE TRENDLINE OVER THIS PERIOD.

In Outpatients, the mean LoS prior to May 2019 was 1.3 hours and the longer term trend in the pre-roll out phase (from Jul 2018 to Jun 2019) shows a mean LoS of 1.6 hours. This compares to 2.6 hours in the post roll out period. It is therefore conceivable that the increase in LoS from Jul 2019 onwards is following the rising trend from April/May 2019 onwards.

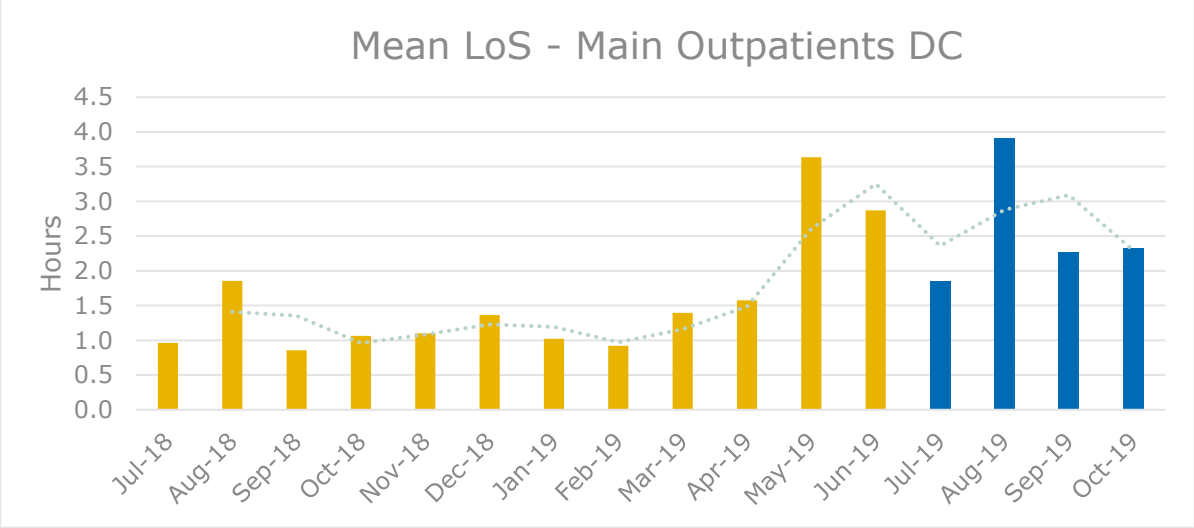


FIGURE 12 COMPARISON OF THE MEAN LOS IN OUTPATIENTS PER MONTH OVER THE PRE-IMPLEMENTATION PERIOD JUL 2018-JUN 2019 (ORANGE) AND POST-IMPLEMENTATION PERIOD JUL-OCT 2019 (BLUE), TOGETHER WITH THE MOVING AVERAGE TRENDLINE OVER THIS PERIOD.

It is not straight forward to attribute any of these increases and decreases in mean LoS directly to the introduction and usage of Medic Bleep, as there many variables which could have contributed to these changes. Furthermore, considering the mean LoS is both leading to longer and shorter LoS in a variety of wards suggests that wider issues are influencing the data. Additionally, there was only a statistically significant difference in mean LoS between the corresponding periods in four wards across the whole hospital.

Changes in/Efficiency of Delayed Transfer of Care (MSitDT)

Delayed transfer of care data reports are collected monthly by all NHS Trusts[21]. These monthly situation reports (MSitDTs) record the total number of delayed days during the month for all patients.

Figure 13 illustrates the comparison of the total number of delayed days in the transfer of care before and after the roll out of Medic Bleep. In the post implementation period (Jul-Oct 2019) there was a statistically significant (at 95% confidence levels) *increase* in the mean number of delayed transfer of care days (405 days) compared to the pre-implementation period Jul-Oct 2018 (mean number of delayed days 240). This increase in the number of delayed days in the period following the roll out of Medic Bleep cannot of course be directly attributed to its adoption and usage, indeed, Figure 14 illustrates the rising trend in the number of days delayed (moving average, period 2) in the period leading up to, and following, the roll out of Medic Bleep, indicating that the number of delayed days had been rising steadily and then levelling off during the pre-implementation phase.

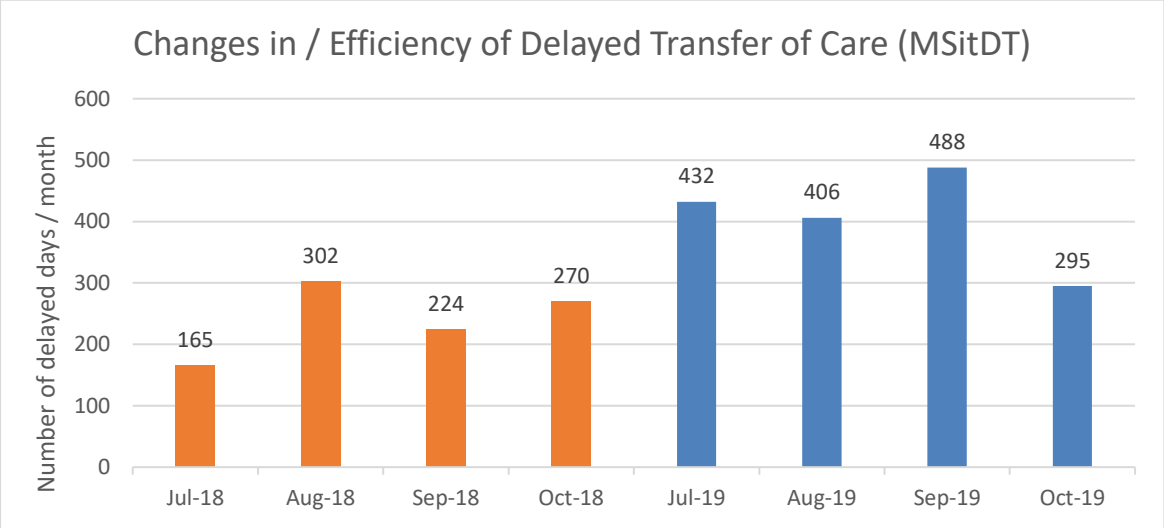


FIGURE 13 COMPARISON OF THE TOTAL NUMBER OF DELAYED DAYS PER MONTH OVER THE PRE-IMPLEMENTATION PERIOD JUL-OCT 2018 (ORANGE) AND POST-IMPLEMENTATION PERIOD JUL-OCT 2019 (BLUE).

[21] NHS Digital, MSitDT Delayed Transfers of Care (DTOC) Return Data Collection, https://digital.nhs.uk/data-and-information/data-collections-and-data-sets/data-collections/msitdt-delayed-transfers-of-care-return-data-collection Accessed 8.1.20

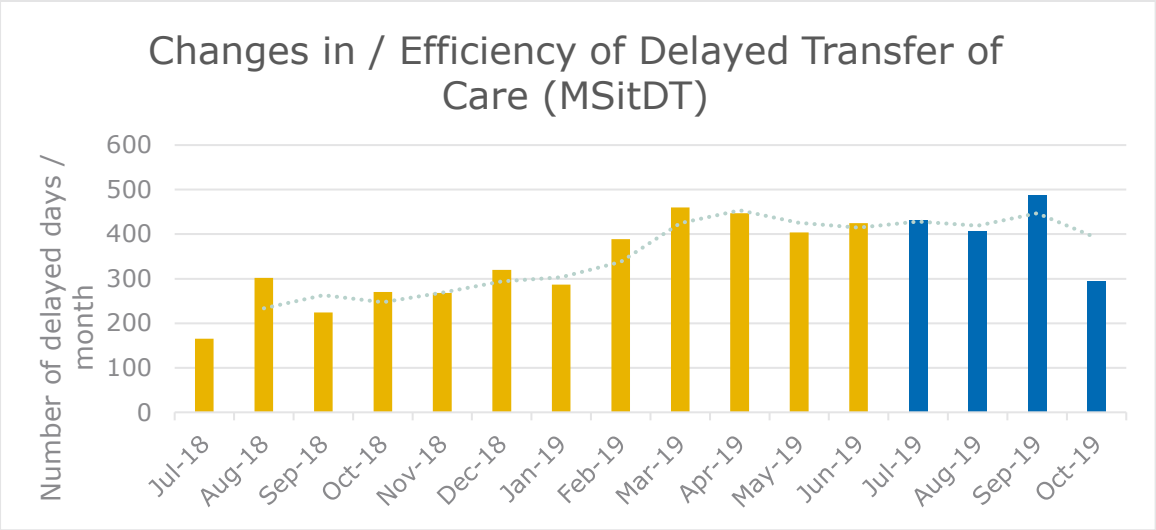


FIGURE 14 COMPARISON OF THE TOTAL NUMBER OF DELAYED DAYS PER MONTH OVER THE PRE-IMPLEMENTATION PERIOD JUL 2018-JUN 2019 (ORANGE) AND POST-IMPLEMENTATION PERIOD JUL-OCT 2019 (BLUE), TOGETHER WITH THE MOVING AVERAGE TRENDLINE OVER THIS PERIOD

Changes in the Efficiency of Discharge Times

Over the period Jul - Oct 2019 compared to Jul – Oct 2018, there was a statistically significant (but at 90% confidence levels, not 95%) increase in the proportion of in-patients being discharged before 11am. The mean proportion of patients discharged before 11am following the introduction of Medic Bleep change was 4.9% compared to 3.6% in the equivalent pre-roll out period (Figure 15), this equates to a mean of 71 patients per month being discharged before 11am, compared to 42 patients in the baseline period.

While it is certainly conceivable that the use of Medic Bleep has facilitated communication and contributed to earlier discharge for these patients, the increase in the proportion of early discharge (1.3%) is relatively small (although statistically significant at 90% confidence levels) Consequently it is difficult to directly attribute the use of Medic Bleep for this change. The trend in the proportion of patients being discharged before 11am (Figure 15) had been rising in the four months (Mar–Jun 2019) leading up to the introduction of Medic Bleep (at the end of June 2019) and it is possible that this trend may have continued regardless of the introduction of Medic Bleep.

There were no statistically significant differences in the mean proportion of day cases or maternity patients being discharged before 11am.

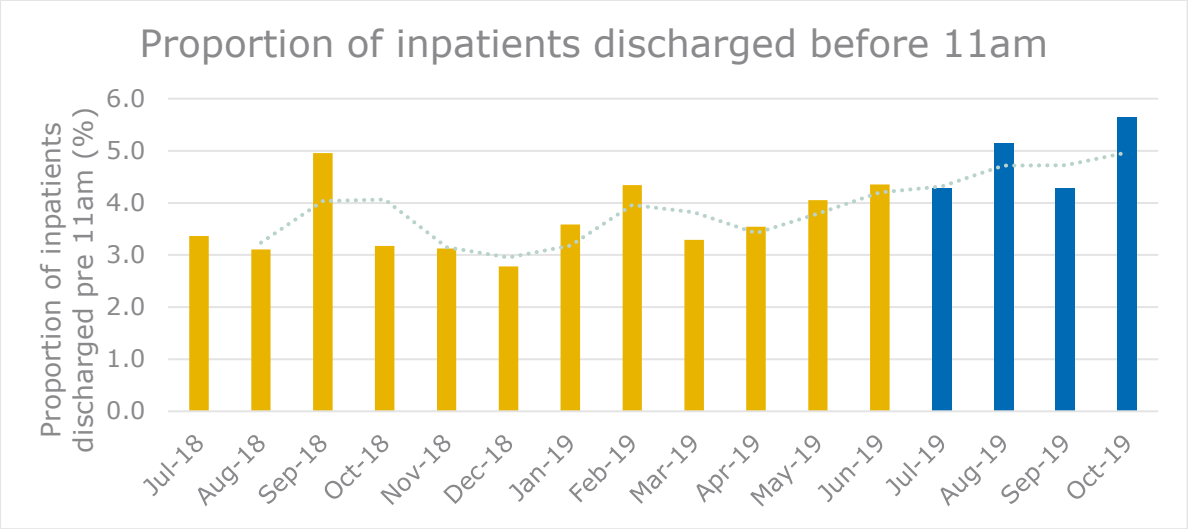


FIGURE 15 COMPARISON OF THE PROPORTION OF IN-PATIENTS BEING DISCHARGED BEFORE 11AM PER MONTH OVER THE PRE-IMPLEMENTATION PERIOD JUL 2018-JUN 2019 (ORANGE) AND POST-IMPLEMENTATION PERIOD JUL-OCT 2019 (BLUE), TOGETHER WITH THE MOVING AVERAGE TRENDLINE OVER THIS PERIOD.

Number of cancelled operations

There was no statistically significant difference (at 90% confidence levels) in the mean number of cancelled operations in the period Jul-Oct 2018 (mean number of cancelled operations 38) compared to the post roll-out period Jul Oct 2019 (mean 34). Figure 16 illustrates the monthly changes over the period Jul-Oct 2019 and the corresponding period from 2018. Figure 17 shows the trend (moving average, period 2) over this period and the intervening months.

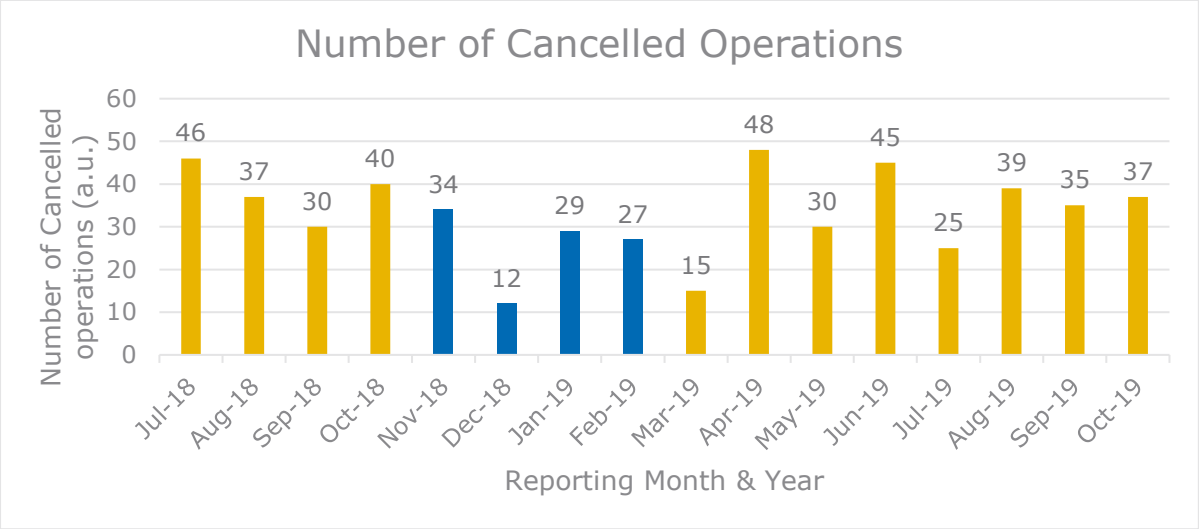


FIGURE 16 COMPARISON OF NUMBER OF CANCELLED OPERATIONS PER MONTH OVER THE PRE-IMPLEMENTATION PERIOD JUL-OCT 2018 (ORANGE) AND POST-IMPLEMENTATION PERIOD JUL-OCT 2019 (BLUE).

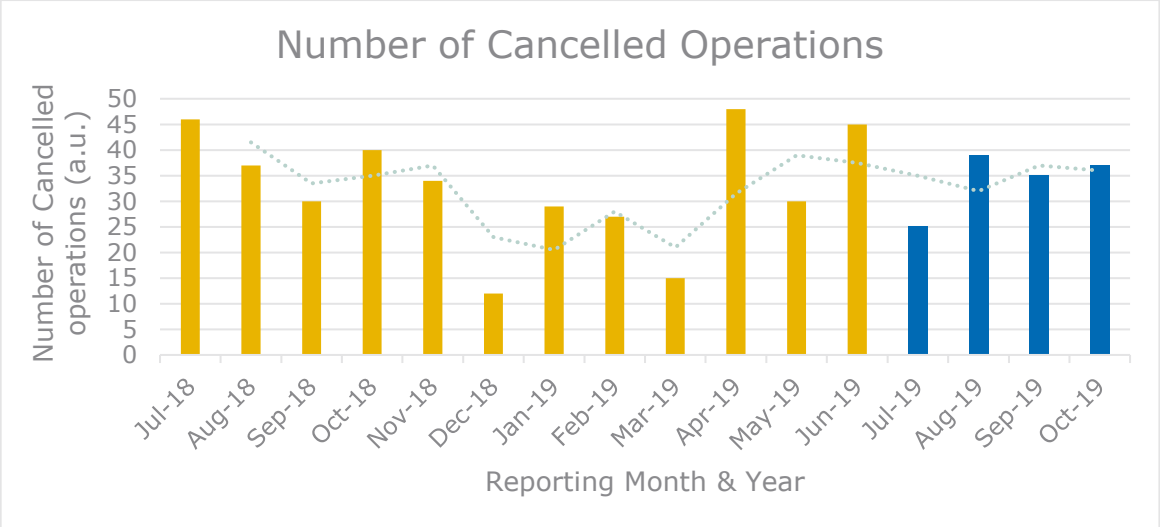


FIGURE 17 COMPARISON OF THE NUMBER OF CANCELLED OPERATIONS PER MONTH OVER THE PRE-IMPLEMENTATION PERIOD JUL 2018-JUN 2019 (ORANGE) AND POST-IMPLEMENTATION PERIOD JUL-OCT 2019 (BLUE), TOGETHER WITH THE MOVING AVERAGE TRENDLINE OVER THIS PERIOD.

Number of elective surgeries

The mean number of elective surgeries (1093) in the post implementation period (Jul-Oct 2019) was slightly lower than the corresponding months in 2018 (mean 1194), but the difference was not statistically significant at 90% confidence levels. The data for these corresponding periods and the data and moving average trend in the intervening are shown in Figure 18 and Figure 19.

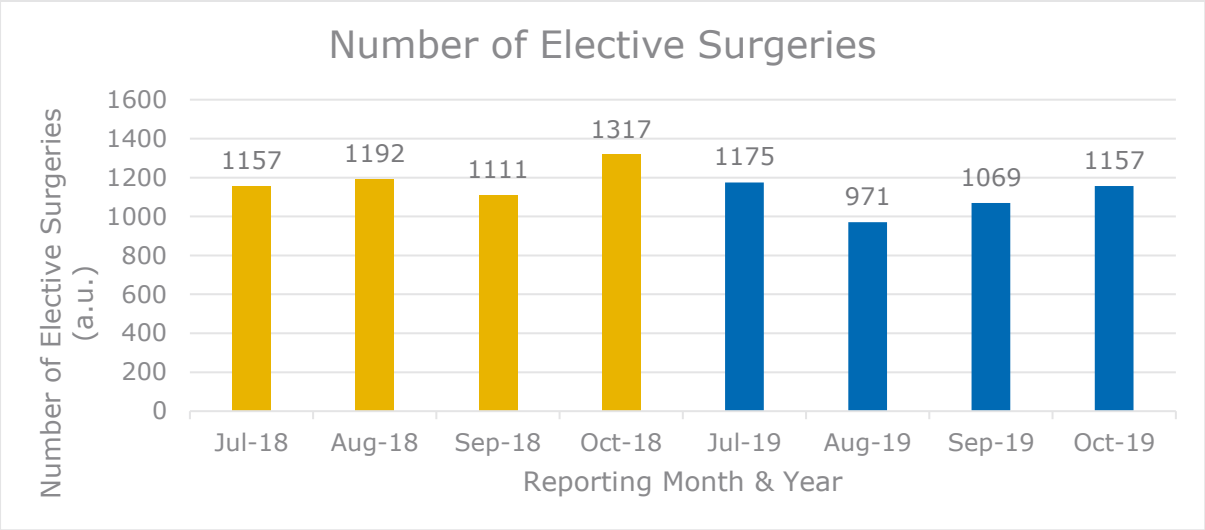


FIGURE 18 COMPARISON OF NUMBER OF ELECTIVE SURGERIES PER MONTH OVER THE PRE-IMPLEMENTATION PERIOD JUL-OCT 2018 (ORANGE) AND POST-IMPLEMENTATION PERIOD JUL-OCT 2019 (BLUE).

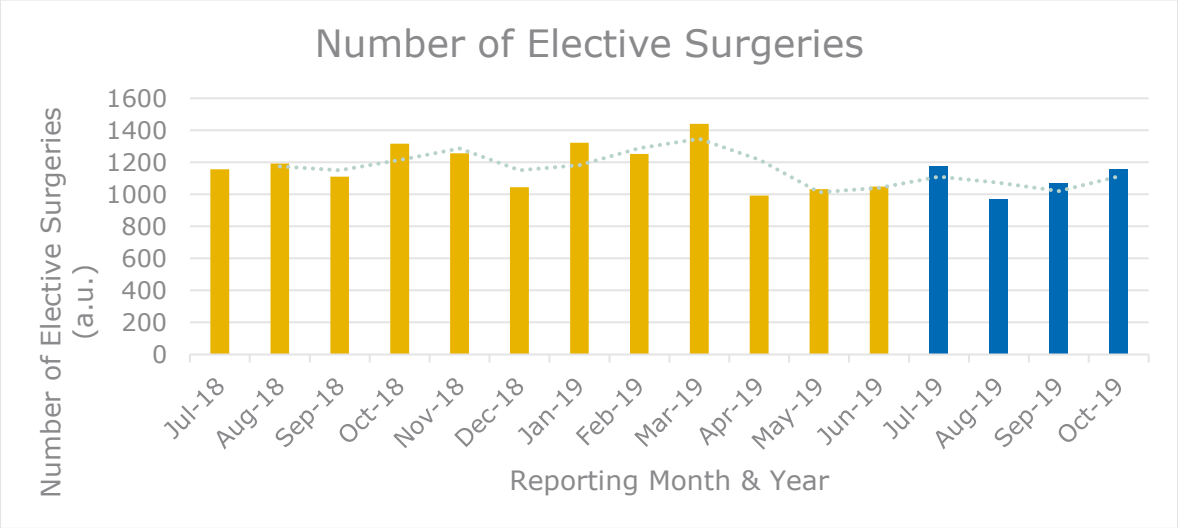


FIGURE 19 COMPARISON OF THE NUMBER OF ELECTIVE SURGERIES PER MONTH OVER THE PRE-IMPLEMENTATION PERIOD JUL 2018-JUN 2019 (ORANGE) AND POST-IMPLEMENTATION PERIOD JUL-OCT 2019 (BLUE), TOGETHER WITH THE MOVING AVERAGE TRENDLINE OVER THIS PERIOD.

Number of non-elective readmissions

There was a statistically significant (at 95% confidence levels) decrease in the mean number of patients having non-elective readmissions (within 30 days) in five wards, in the period Jul-Oct 2019 compared to the corresponding period in 2018 (Figure 20).

Similarly, there was a statistically significant decrease (at 90% confidence levels) in one further ward (F12).

However, there was also a statistically significant (at 95% confidence levels) **increase** in the mean number of patients having non-elective readmissions from the Critical Care Unit over the same time frame, although the sample size is small. Other wards showed no statistically significant differences between the number of patients having non-elective readmissions, or insufficient data was available.

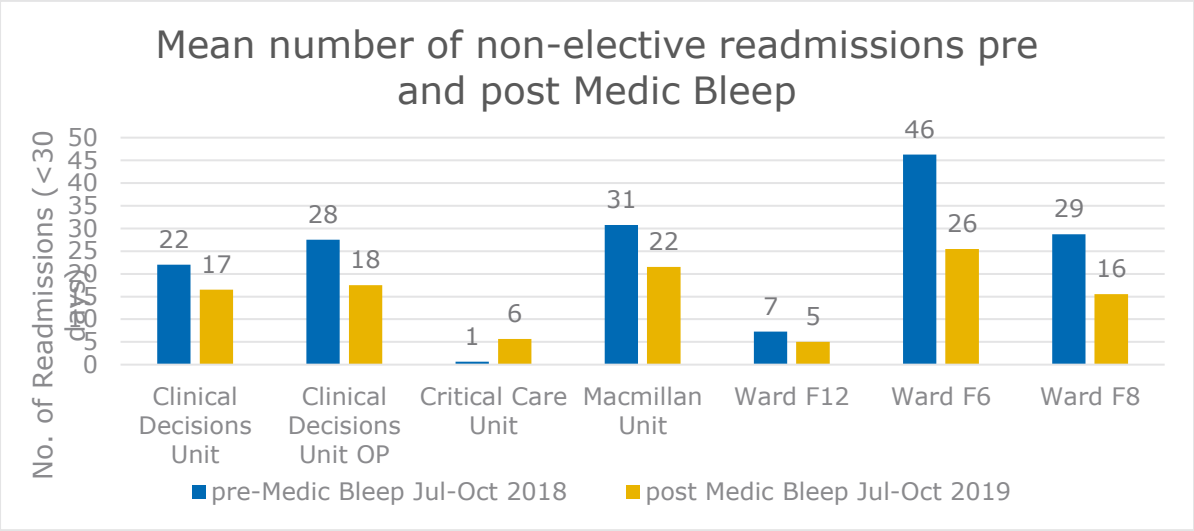


FIGURE 20 COMPARISON OF THE NUMBER OF PATIENTS HAVING NON-ELECTIVE READMISSIONS, PRE AND POST IMPLEMENTATION OF MEDIC BLEEP, IN SEVEN WARDS WHERE THERE IS A STATISTICALLY SIGNIFICANT DIFFERENCE

Further analysis of the trends in the number of non-elective readmissions, in each of these wards, in the intervening months across the whole period, provides some further insight on the data.

In the Clinical Decisions Unit OP (Outpatients) the mean number (18) of non-elective readmissions is lower and statistically significant in Jul-Oct 2019 compared to both the corresponding months in 2018 (mean 28) and the longer trend period, Jul 2018-Jun 2019 (mean 23) - Figure 21.

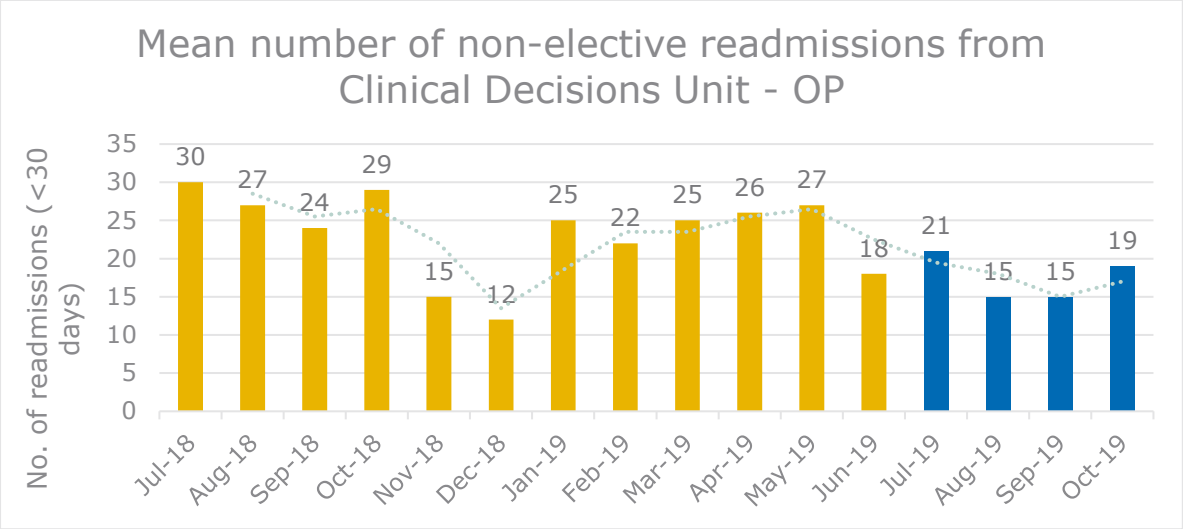


FIGURE 21 COMPARISON OF THE NUMBER OF NON-ELECTIVE READMISSIONS (<30 DAYS) IN THE CLINICAL DECISIONS UNIT (OP) IN THE PRE-IMPLEMENTATION PERIOD JUL 2018-JUN 2019 (ORANGE) AND POST-IMPLEMENTATION PERIOD JUL-OCT 2019 (BLUE), TOGETHER WITH THE MOVING AVERAGE TRENDLINE OVER THIS PERIOD.

A similar picture is evident in Ward F6 (Figure 22). The trend in numbers of patients from Ward F6 having non-elective readmissions was falling prior to the roll out of Medic Bleep, however, the mean number is lower (26) and statistically significant (at 95% confidence limits) in Jul-Oct

corresponding months in 2018 (mean 46) and the longer trend period, Jul 2018-Jun 2019, (mean 39).

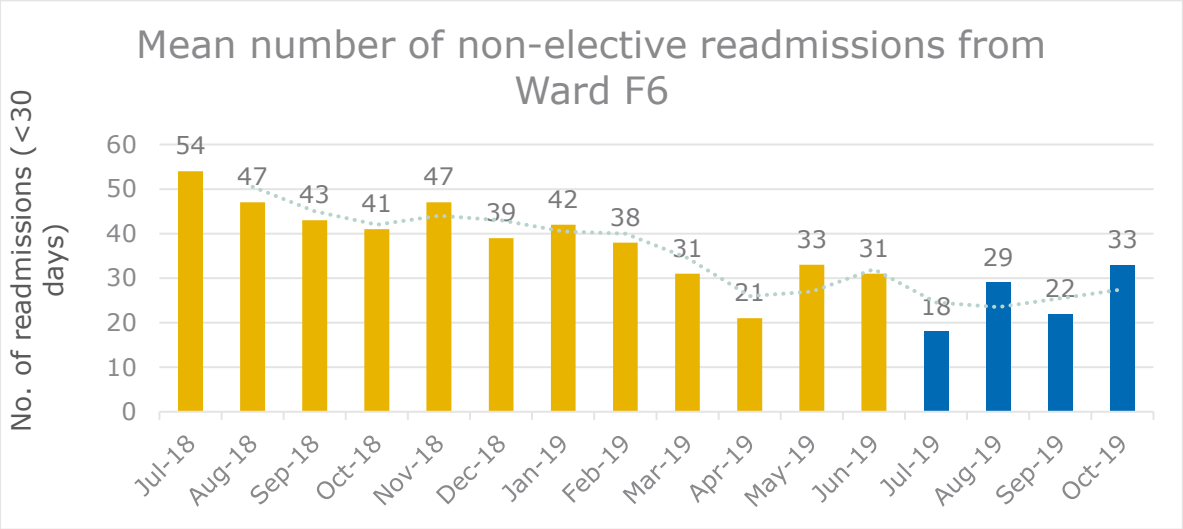


FIGURE 22 COMPARISON OF THE NUMBER OF NON-ELECTIVE READMISSIONS (<30 DAYS) IN WARD F6 IN THE PRE-IMPLEMENTATION PERIOD JUL 2018-JUN 2019 (ORANGE) AND POST-IMPLEMENTATION PERIOD JUL-OCT 2019 (BLUE), TOGETHER WITH THE MOVING AVERAGE TRENDLINE OVER THIS PERIOD.

In contrast, the mean number of non-elective readmissions arising from the Critical Care Unit (Figure 23) increased in the post implementation phase compared to the corresponding months in 2018 and the longer term pre-roll out period (Jul 2018 to Jun 2019). While the number of patients affected is low, the increase in the mean number of readmissions was statistically significant in both cases.

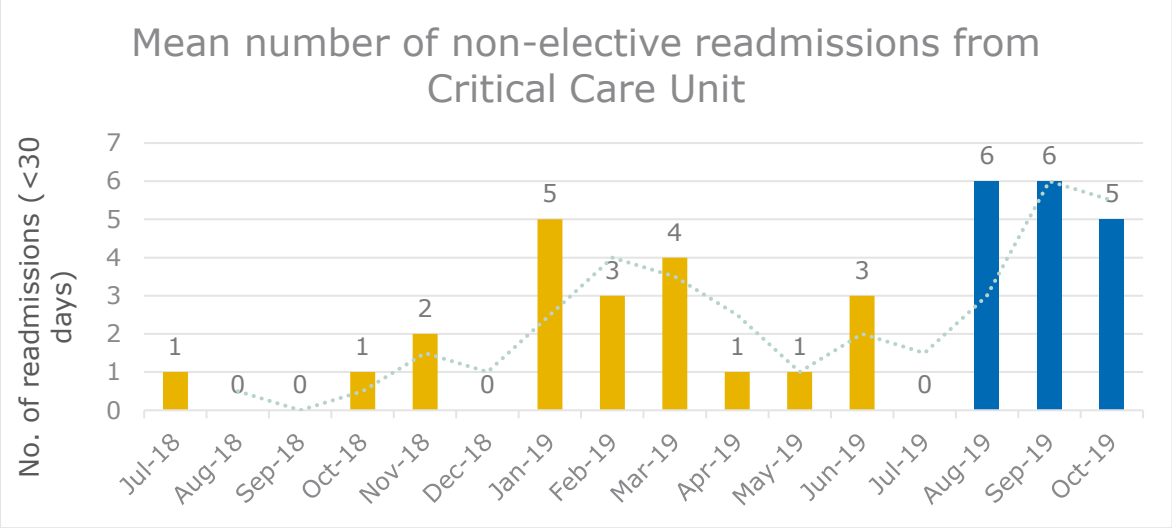


FIGURE 23 COMPARISON OF THE NUMBER OF NON-ELECTIVE READMISSIONS (<30 DAYS) FROM THE CRITICAL CARE UNIT IN THE PRE-IMPLEMENTATION PERIOD JUL 2018-JUN 2019 (ORANGE) AND POST-IMPLEMENTATION PERIOD JUL-OCT 2019 (BLUE), TOGETHER WITH THE MOVING AVERAGE TRENDLINE OVER THIS PERIOD.

It is of course difficult to judge whether the use of Medic Bleep may have been the primary cause of the decrease in the mean number of readmissions (in the Ward F6 and Clinical Decision Unit - OP) or the increase in readmissions in the Critical Care Unit. It is therefore also challenging to estimate or model any health economic benefit (or cost), partly because the nature of the readmissions from the various wards are unknown and also because the readmissions from the Critical Care Unit will probably have a greater cost impact than any potential saving from fewer readmitted individuals from outpatients.

In the other wards showing a potential reduced number of readmissions (Clinical Decision Unit, Macmillan Unit, Ward F12 and Ward F8) in the post implementation phase, analysis of

the mean number of non-elective readmissions over a longer trend period (Jul 2018 to Jun 2019), demonstrated there was no significant difference (at either 90% or 95% confidence limits) in these wards. Additionally, the status of Ward F8 changed in Dec 2018 due to the new AAU ward opening from November 2018, where previously the AAU beds were situated on ward F8. The trends in these wards are shown in Figure 24 and Figure 25.

In the Clinical Decisions Unit, the trend in the number of non-elective readmissions had been falling in the months leading up to the roll out of Medic Bleep, only to rise slightly post roll out. In the Macmillan Unit, while the numbers of patients being readmitted figures in Jun-Oct 2019 compared to Jul-Oct 2018 are lower, the trend prior to roll out had been falling and the data was very similar in the months Feb-Jun 2019 and Jul-Oct 2019, indicating that the introduction of Medic Bleep has had minimal effect on reducing readmissions in either of these wards.

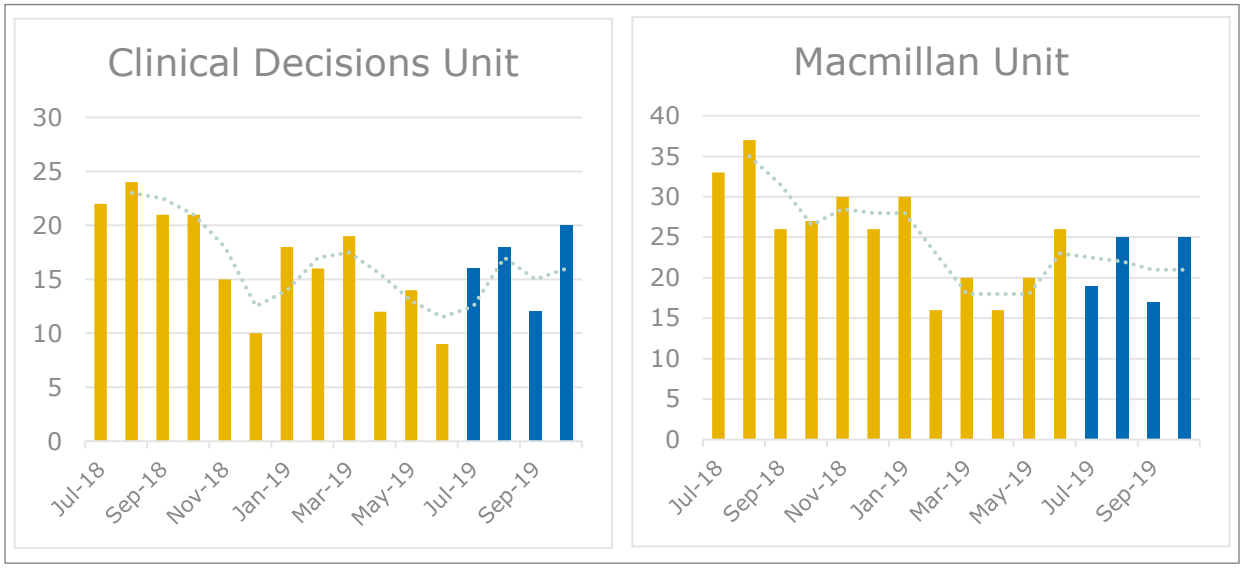


FIGURE 24 COMPARISON OF THE NUMBER OF NON-ELECTIVE READMISSIONS (<30 DAYS) IN TWO WARDS (CLINICAL DECISIONS UNIT & MACMILLAN UNIT) IN THE PRE-IMPLEMENTATION PERIOD JUL 2018-JUN 2019 (ORANGE) AND POST-IMPLEMENTATION PERIOD JUL-OCT 2019 (BLUE), TOGETHER WITH THE MOVING AVERAGE TRENDLINE OVER THIS PERIOD.

A similar pattern is evident in wards F12 & F8 (Figure 25). As previously stated the status of Ward F8 changed in Nov/Dec 2018, which skews this analysis. While the numbers of patients being readmitted in ward F12 (<30 days) in Jun-Oct 2019 are lower (and statistically significant at 90% and 95% respectively) compared to Jul-Oct 2018. When comparing the mean from a longer period (Jul 2018 to Jun 2019), in order to capture the trend, with the post Medic Bleep period there is no statistical difference in numbers of patients being readmitted in ward F12. Indeed, there have been periods in the intervening months where the numbers of patients readmitted have been lower than during the post roll out period. There is therefore no clear evidence that Medic Bleep has had an influence on reducing patient readmittance in ward F12.

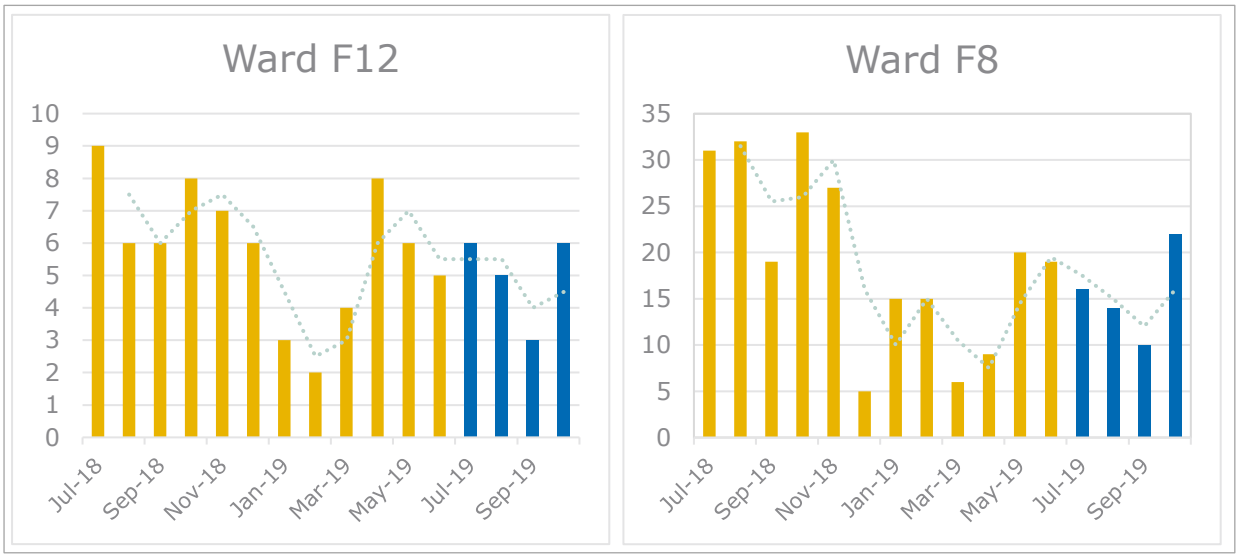


FIGURE 25 COMPARISON OF THE NUMBER OF NON-ELECTIVE READMISSIONS (<30 DAYS) IN TWO WARDS (F12 & F8) IN THE PRE-IMPLEMENTATION PERIOD JUL 2018-JUN 2019 (ORANGE) AND POST-IMPLEMENTATION PERIOD JUL-OCT 2019 (BLUE), TOGETHER WITH THE MOVING AVERAGE TRENDLINE OVER THIS PERIOD.

Data on bed availability in general and acute wards

Subtracting the mean (and total) number of occupied beds from the mean (and total) number of open beds each month gives an overview of bed availability. There was no statistically significant difference (at 90% confidence limits) in the mean (or total) bed availability in the pre-implementation period (Jul-Oct 2018) compared to the period following the roll out of Medic Bleep (Jul-Oct 2019). Bed availability differences are illustrated in Figure 26 (monthly average) and Figure 27 (total number of beds per month).

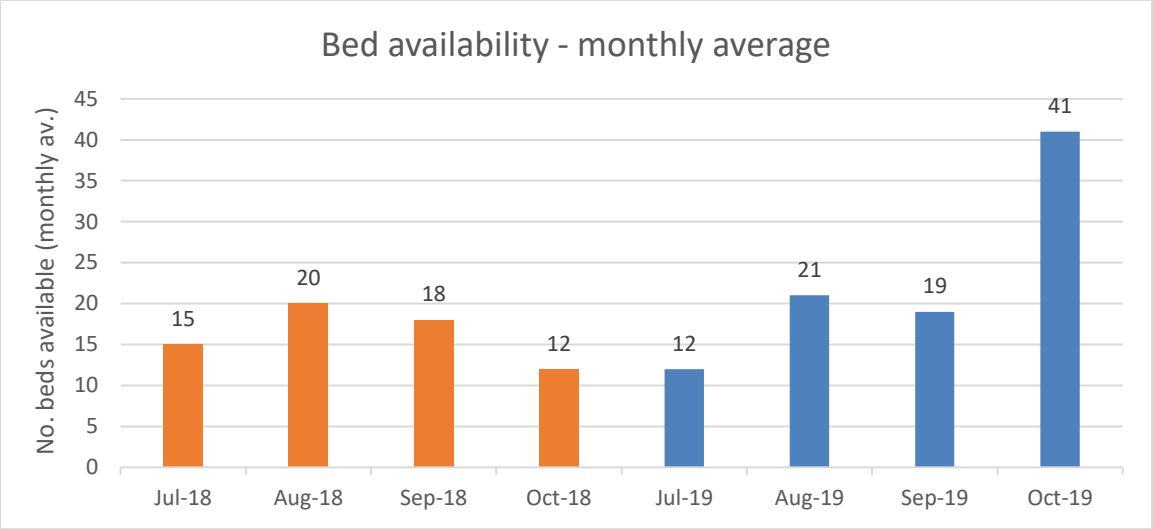


FIGURE 26 COMPARISON OF MEAN BED AVAILABILITY (CALCULATED AS MEAN NUMBER OF BEDS OPEN, LESS MEAN NUMBER OF BEDS OCCUPIED) IN THE PRE-IMPLEMENTATION PERIOD JUL-OCT 2018 (ORANGE) AND POST ROLL OUT PERIOD JUL-OCT 2019 (BLUE).

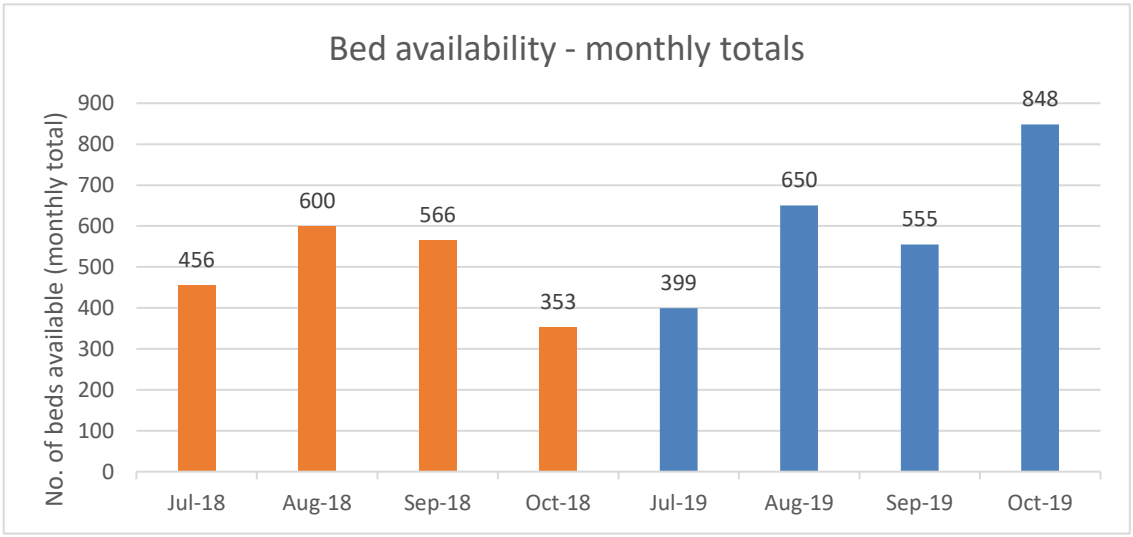


FIGURE 27 COMPARISON OF TOTAL BED AVAILABILITY (CALCULATED AS TOTAL NUMBER OF BEDS OPEN, LESS TOTAL NUMBER OF BEDS OCCUPIED) IN THE PRE-IMPLEMENTATION PERIOD JUL-OCT 2018 (ORANGE) AND POST ROLL OUT PERIOD JUL-OCT 2019 (BLUE).

Number of cases where decision to admit in A&E exceeds four hours

Figure 28 illustrates the comparison of the total number of cases where the decision to admit in A&E exceeded four hours, in equivalent periods both before and after the roll out of Medic Bleep. In the post implementation period (Jul-Oct 2019) there was a statistically significant (at 90%, but not 95%, confidence levels) *increase* in the mean number of cases where the decision to admit in A&E exceeded four hours (mean number of four hour breaches 78) compared to the pre-implementation period Jul-Oct 2018 (mean number of four hour breaches 26).

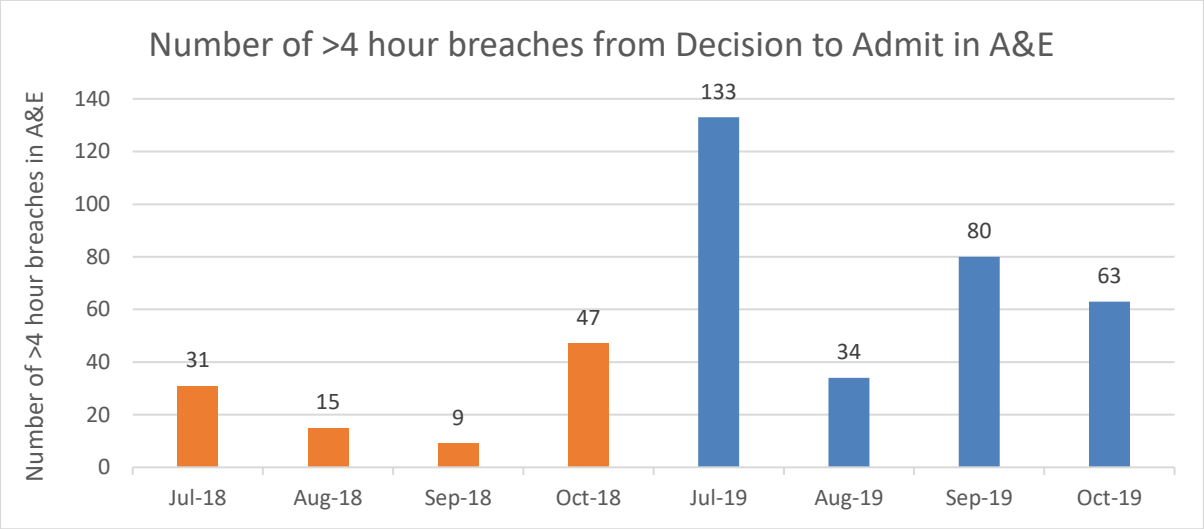


FIGURE 28 COMPARISON OF THE NUMBER OF 4 HOUR BREACHES IN THE DECISION TO ADMIT IN A&E OVER THE PRE-IMPLEMENTATION PERIOD JUL-OCT 2018 (ORANGE) AND POST-IMPLEMENTATION PERIOD JUL-OCT 2019 (BLUE).

This increase in the number of four hour breaches, in the Decision to Admit, in the period Jul-Oct 2019 (post roll out) compared to Jul 2018-Jun 2019 (pre roll out) and the moving average trend (period 2) in these intervening months is illustrated in Figure 29. Clearly, in a complex clinical environment, it is difficult to directly attribute these changes to the introduction of Medic Bleep. In the period since the roll out of Medic Bleep, the moving average trend has fallen, principally due to the relatively low number of breaches in Aug 2019 (34). However, the number of four hour breaches in the period post roll out of Medic Bleep still remains higher each month than the corresponding period in 2018. Additionally, the number of breaches in Sep and Oct 2019 (80 and 63 respectively) were close to the long term mean (72).

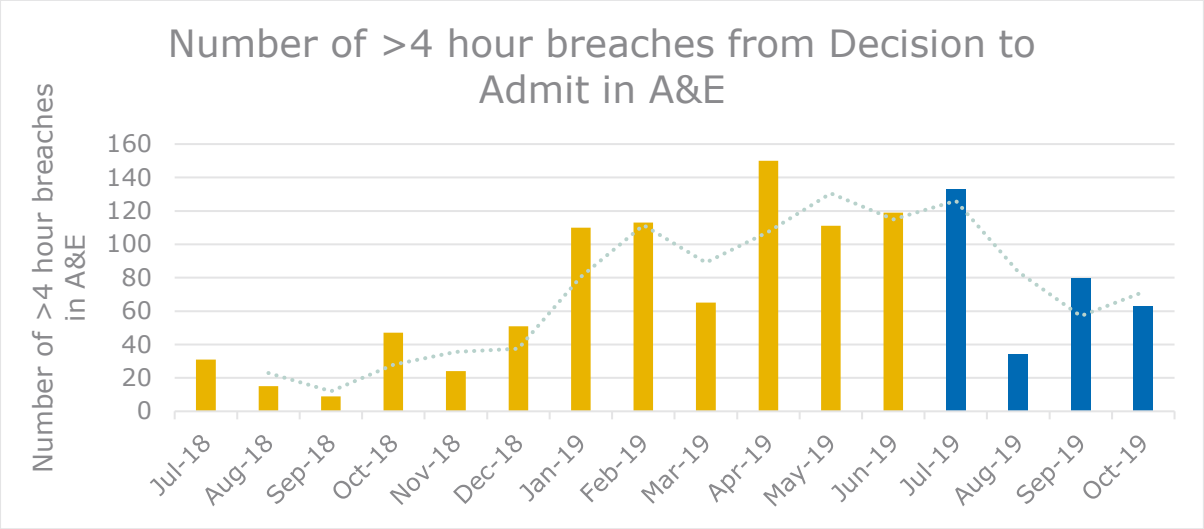


FIGURE 29 COMPARISON OF THE NUMBER OF 4 HOUR BREACHES IN THE DECISION TO ADMIT IN A&E OVER THE PRE-IMPLEMENTATION PERIOD JUL 2018-JUN 2019 (ORANGE) AND POST-IMPLEMENTATION PERIOD JUL-OCT 2019 (BLUE), TOGETHER WITH THE MOVING AVERAGE TRENDLINE OVER THIS PERIOD.

ED six hour breaches (from Arrival to Departure)

The mean number of six hour breaches (422) in the post roll out phase (Jul-Oct 2019) was higher than the corresponding months (Jul-Oct 2018) prior to implementation (236) and when comparing (Figure 30) the mean number of breaches in these corresponding months the increase was statistically significant at 90% confidence levels (but not 95%).

The trend in ED six hour breaches is illustrated in Figure 31, which shows an uneven trend over this 16 month period, although three of the highest number of breaches since Jun 2018 occurred in the post roll out period (July, Sep & Oct 2019). As stated above, in a complex clinical environment such as ED, it is difficult to pin point causes for increased numbers of six hour breaches and clearly the roll out Medic Bleep cannot be directly attributed to the increase identified.

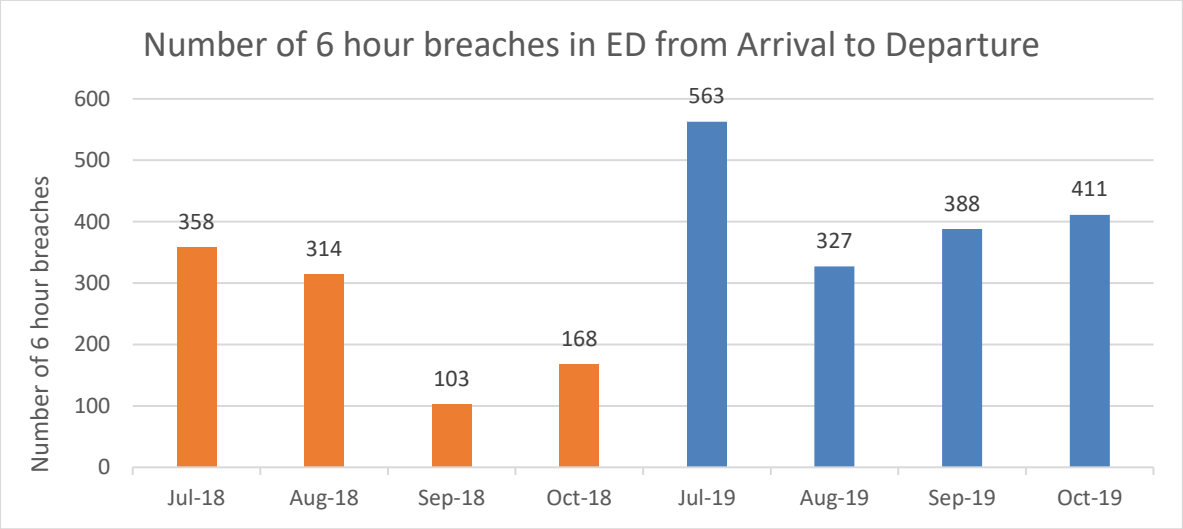


FIGURE 30 COMPARISON OF THE NUMBER OF 6 HOUR BREACHES IN ED (FROM ARRIVAL TO DEPARTURE) IN THE PRE-IMPLEMENTATION PERIOD JUL-OCT 2018 (ORANGE) AND CORRESPONDING POST-IMPLEMENTATION PERIOD JUL-OCT 2019 (BLUE).

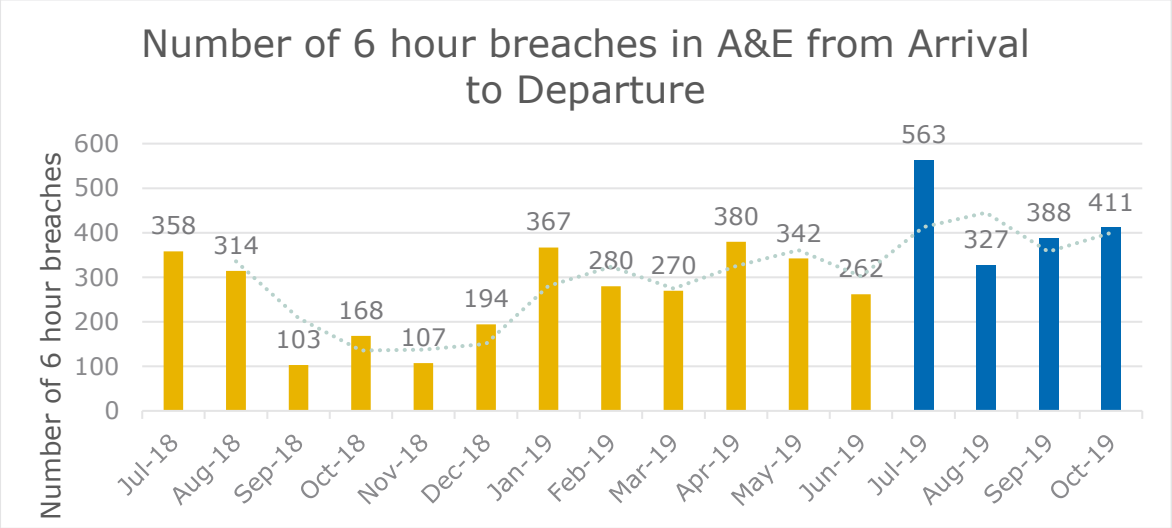


FIGURE 31 COMPARISON OF THE NUMBER OF 6 HOUR BREACHES IN A&E BETWEEN ARRIVAL AND DEPARTURE OVER THE PRE-IMPLEMENTATION PERIOD JUL 2018-JUN 2019 (ORANGE) AND POST-IMPLEMENTATION PERIOD JUL-OCT 2019 (BLUE), TOGETHER WITH THE MOVING AVERAGE TRENDLINE OVER THIS PERIOD.

Changes in the number of temporary, agency and bank staff

When comparing the total number of temporary staff (including agency and bank staff) engaged in each month over the pre and post implantation periods, there is little change (Figure 32) and no statistically significant difference in the mean numbers engaged. The mean number of temporary staff in place between Jul and Oct 2018 was 239 and the mean number in the corresponding months, in the post roll out period in 2019, was 244. The trend over this period is shown in Figure 33.

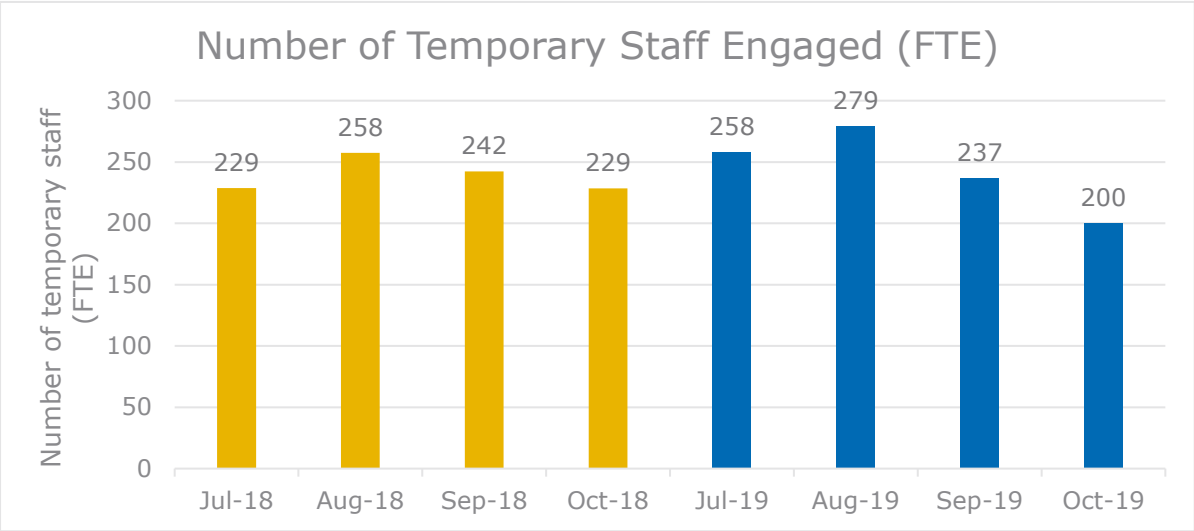


FIGURE 32 COMPARISON OF THE NUMBER OF TEMPORARY STAFF (INCLUDING BANK AND AGENCY STAFF) AT WSH IN THE PRE-IMPLEMENTATION PERIOD JUL-OCT 2018 (ORANGE) AND CORRESPONDING POST-IMPLEMENTATION PERIOD JUL-OCT 2019 (BLUE)

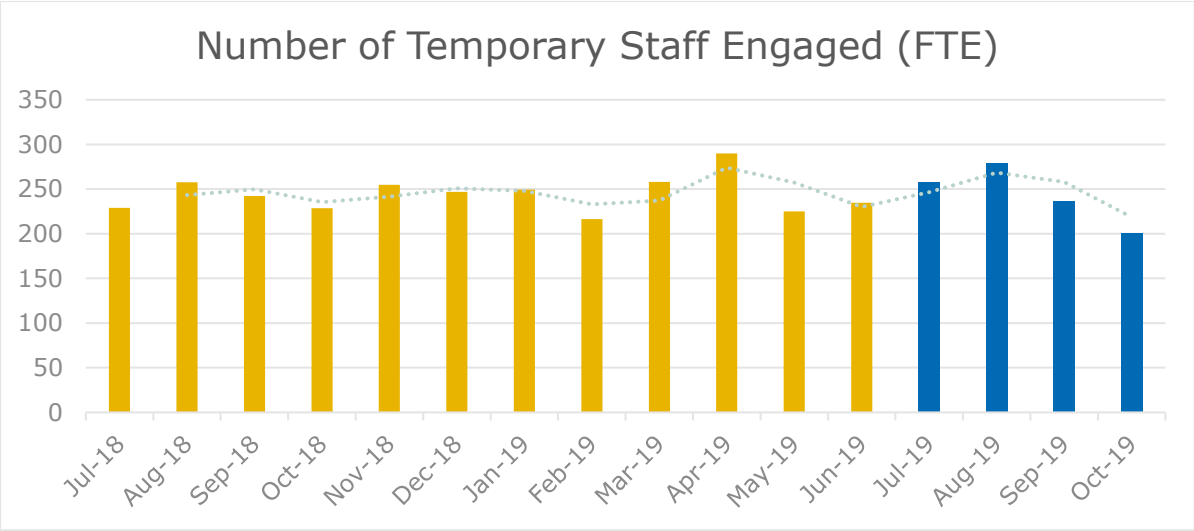


FIGURE 33 COMPARISON OF THE NUMBER OF TEMPORARY STAFF ENGAGED AT WSH IN THE PRE-IMPLEMENTATION PERIOD JUL 2018-JUN 2019 (ORANGE) AND CORRESPONDING POST-IMPLEMENTATION PERIOD JUL-OCT 2019 (BLUE), TOGETHER WITH THE MOVING AVERAGE TRENDLINE OVER THIS PERIOD.

Staff Survey

215 responses to the survey were received. Responses were anonymised, but job function was requested with the breakdown shown in Table 4 below

TABLE 4 BREAKDOWN OF JOB FUNCTION OF THOSE RESPONDING TO THE STAFF SURVEY

Job Function:	
Senior doctor	55
Junior doctor	48
Administrator	33
Nurse	27
Allied health professional	25
Pharmacist	12
Other	7
No response	8
Total	215

The survey data provided both Quantitative and Qualitative responses. Full results are supplied separately (*see* Appendix C).

Quantitative Data

The survey was developed to capture both the perceived usefulness and perceived ease of use of Medic Bleep, both of which combine to boost attitudes and intentions regarding usage and technology acceptance[22].

Selected quantitative results from the survey are shown below.

[22] Davis, F. D.; Bagozzi, R. P.; Warshaw, P. R. (1989), "User acceptance of computer technology: A comparison of two theoretical models", *Management Science*, **35** (8): 982–1003, doi:10.1287/mnsc.35.8.982

PERCEIVED USEFULNESS

Clearly, the majority of the survey respondents find Medic Bleep effective when receiving and responding to messages, with 66% of all respondents either Completely Agreeing or Somewhat Agreeing with the statement "I find Medic Bleep effective in getting a response." (Figure 34). Furthermore, 70% of all respondents either Completely Agree or Somewhat Agree with the statement "I find Medic Bleep effective when responding to messages." (Figure 35).

However, opinion is more split on whether Medic Bleep is more effective than the previous bleeper method, with just 50% of all respondents either Completely Agreeing or Somewhat Agreeing with the statement "I find Medic Bleep more effective in getting a response than the previous bleeper method." (Figure 36).

Opinions also vary on overall satisfaction with Medic Bleep. 48% of all respondents either Completely agree or Somewhat agree with the statement "I am very satisfied with Medic Bleep." (see Figure 37). There is a clear difference in opinion on this question between different job functions with 76% of AHPs and 52% of nurses either Completely Agreeing or Somewhat Agreeing with the statement "I am very satisfied with Medic Bleep." In contrast only 31% of Senior Doctors and 35% of junior doctors Completely Agree or Somewhat Agree with the same statement (Figure 38).

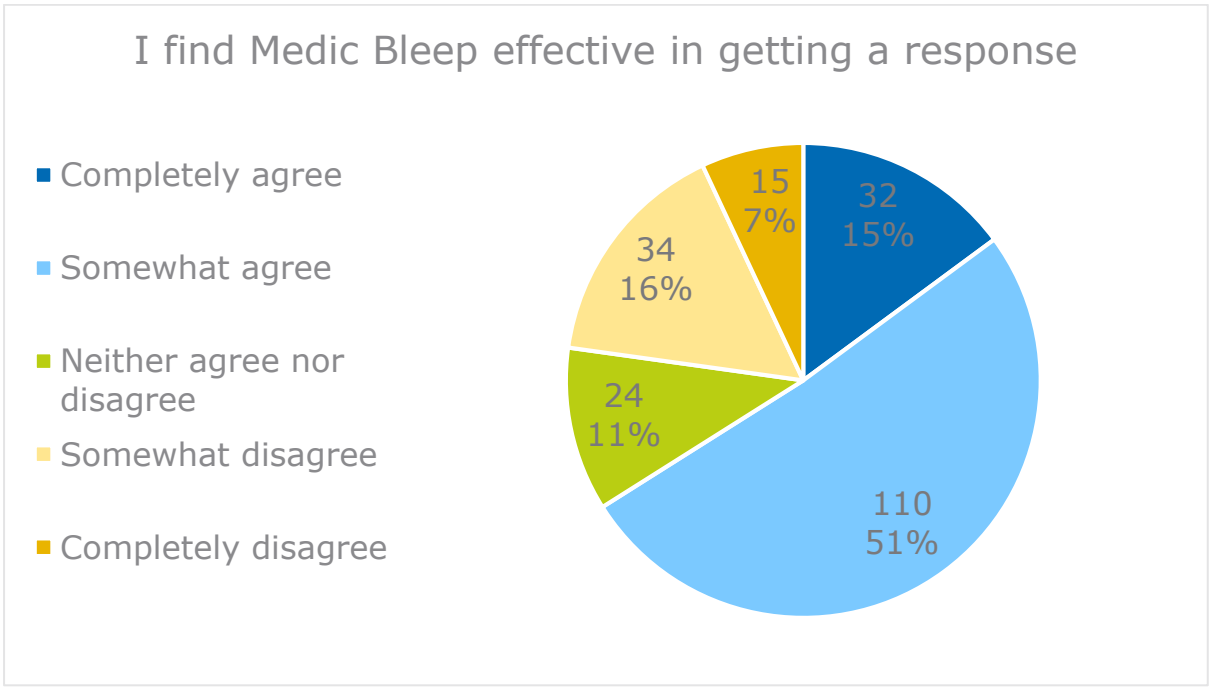


FIGURE 34 PIE CHART DEPICTING ALL RESPONSES TO SURVEY QUESTION" I FIND MEDIC BLEEP EFFECTIVE IN GETTING A RESPONSE"

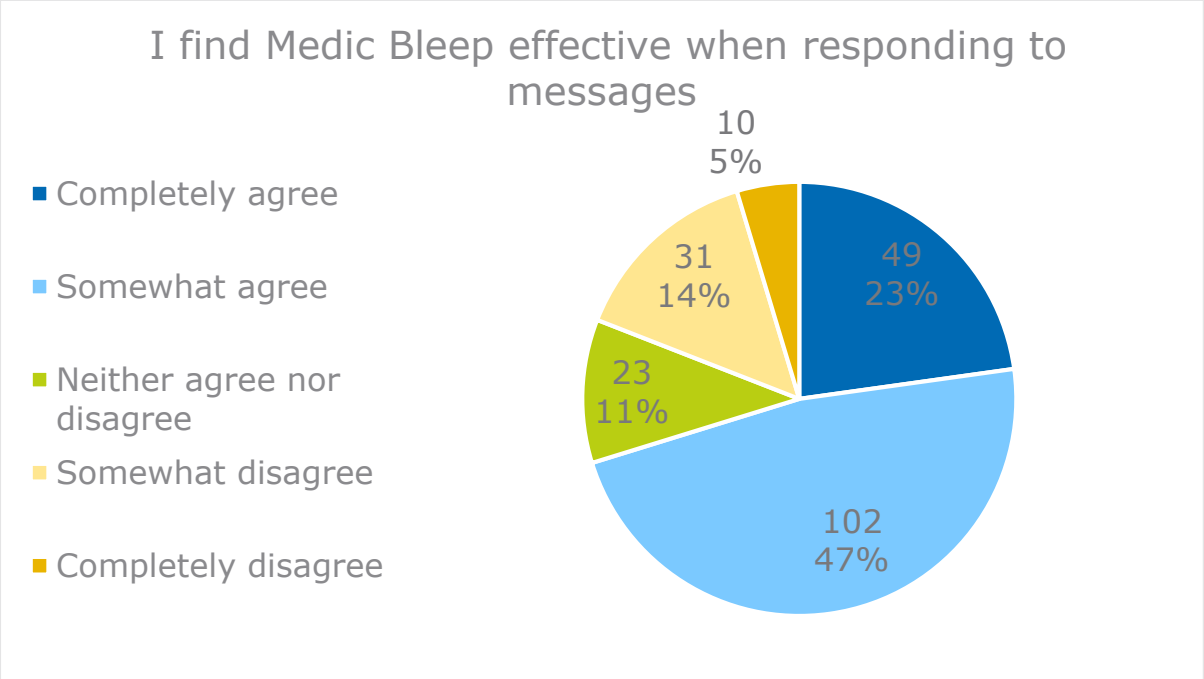


FIGURE 35 PIE CHART DEPICTING ALL RESPONSES TO SURVEY QUESTION" I FIND MEDIC BLEEP EFFECTIVE WHEN RESPONDING TO MESSAGES"

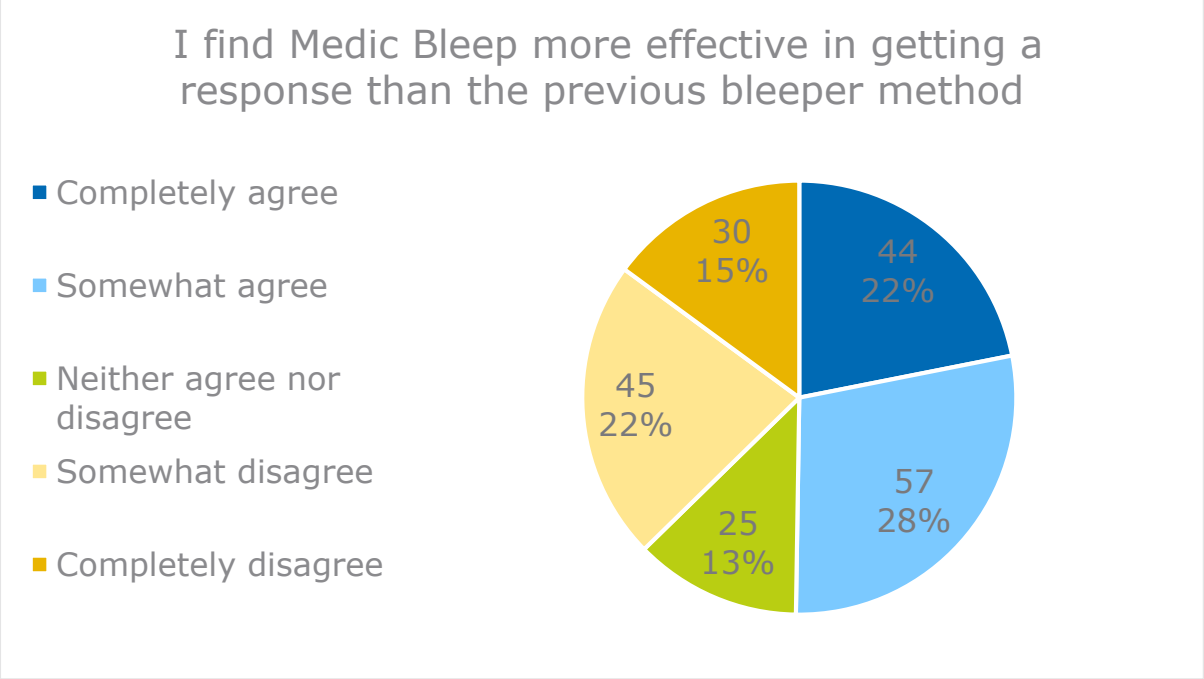


FIGURE 36 PIE CHART DEPICTING ALL RESPONSES TO SURVEY QUESTION "I FIND MEDIC BLEEP MORE EFFECTIVE IN GETTING A RESPONSE THAN THE PREVIOUS BLEEPER METHOD"

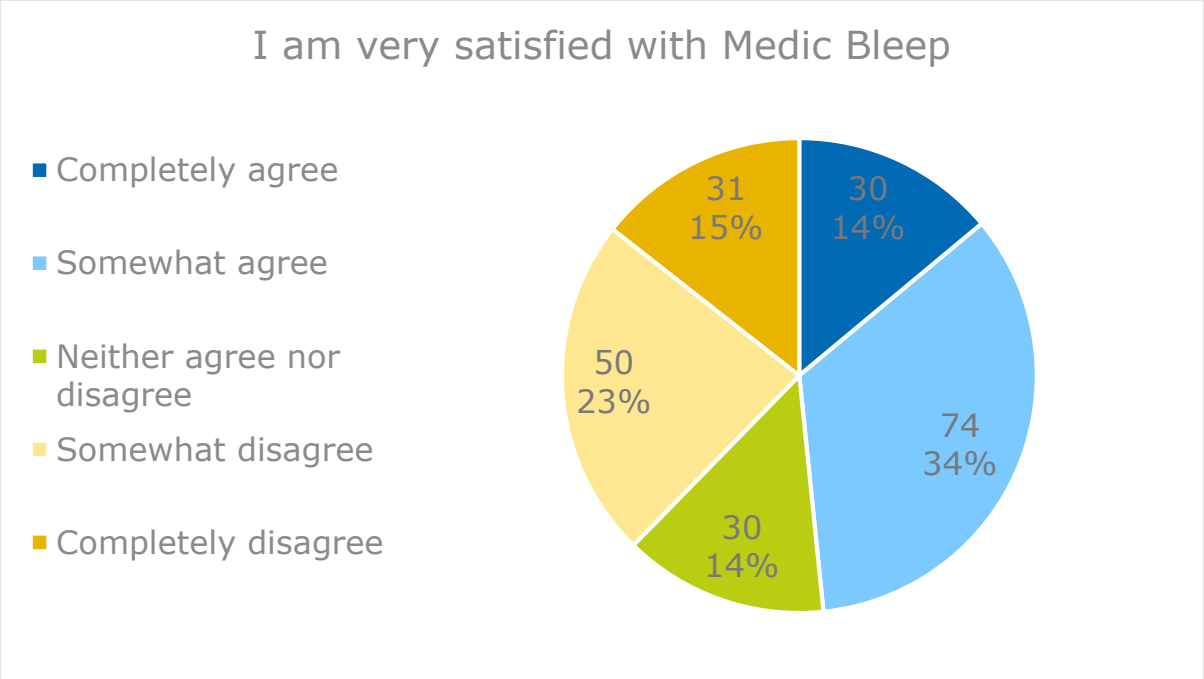


FIGURE 37 PIE CHART DEPICTING ALL RESPONSES TO SURVEY QUESTION "I AM VERY SATISFIED WITH MEDIC BLEEP"

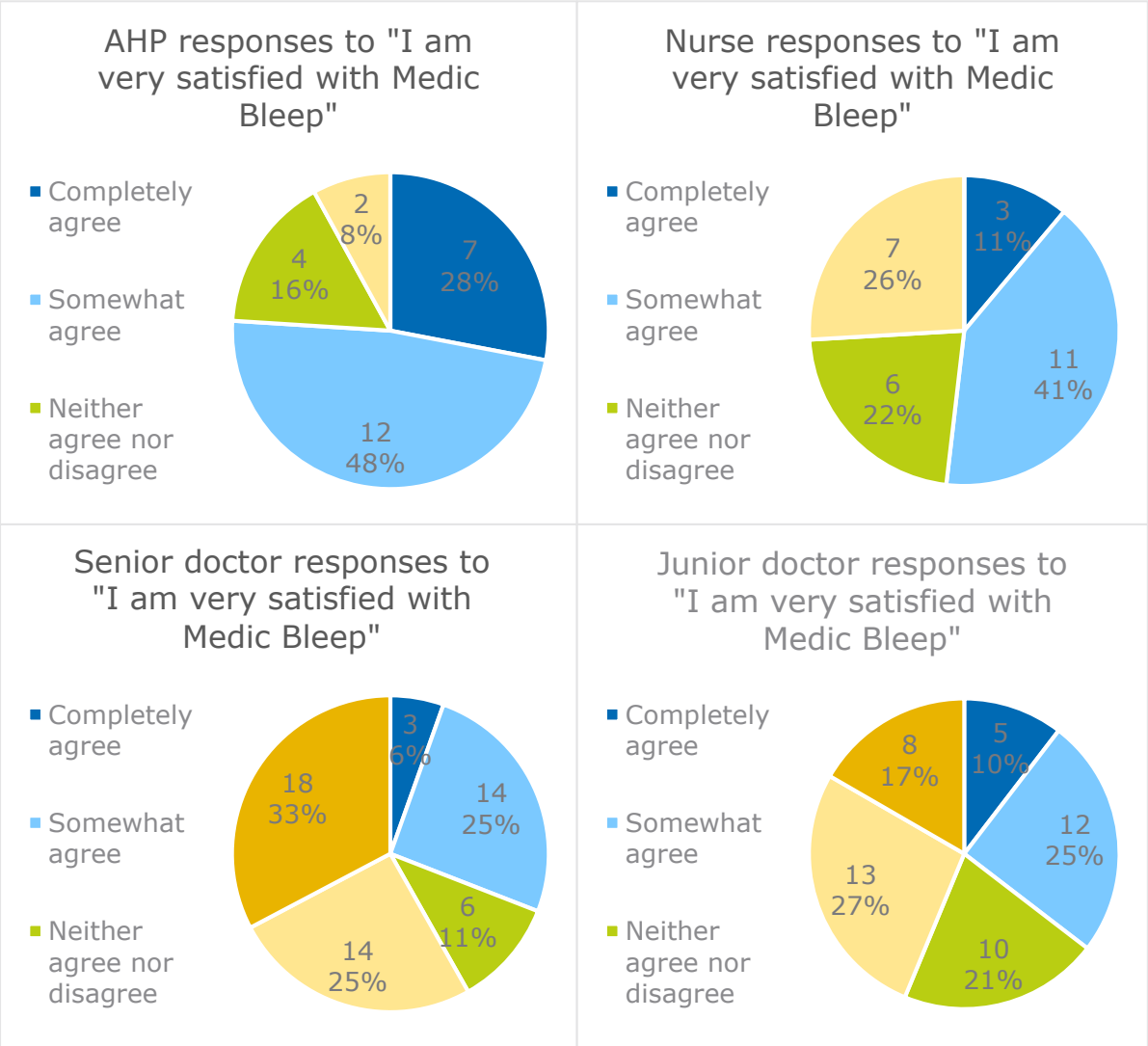


Figure 38 Comparison of responses to the question "I am very satisfied with Medic Bleep" according to job function.

A potential barrier to the perceived usefulness was highlighted in response to the question "I feel comfortable using Medic Bleep onmy mobile phone in the presence of patients", with 66% of Junior Doctors and 60% of Nurses either Completely Disagreeing or Somewhat disagreeing with this statement (Figure 39). This indicates that additional information provided to patients, informing them of the messaging system in place, may be warranted to overcome this perceived barrier and facilitate the effective usefulness and acceptance of Medic Bleep.

The survey also aimed to assess whether clinical staff find that Medic Bleep helps to prioritise their workload and also whether Medic Bleep is more effective than the previous bleeper method in prioritising their workload. Figure 40 shows that only 19% of respondents Completely or Somewhat Agreed that Medic Bleep does help to prioritise their workload, with 23% either Completely or Somewhat Agreeing that Medic Bleep helps to prioritise their workload better than the previous bleeper method. There was no significant difference in responses to this question expressed by different job functions.

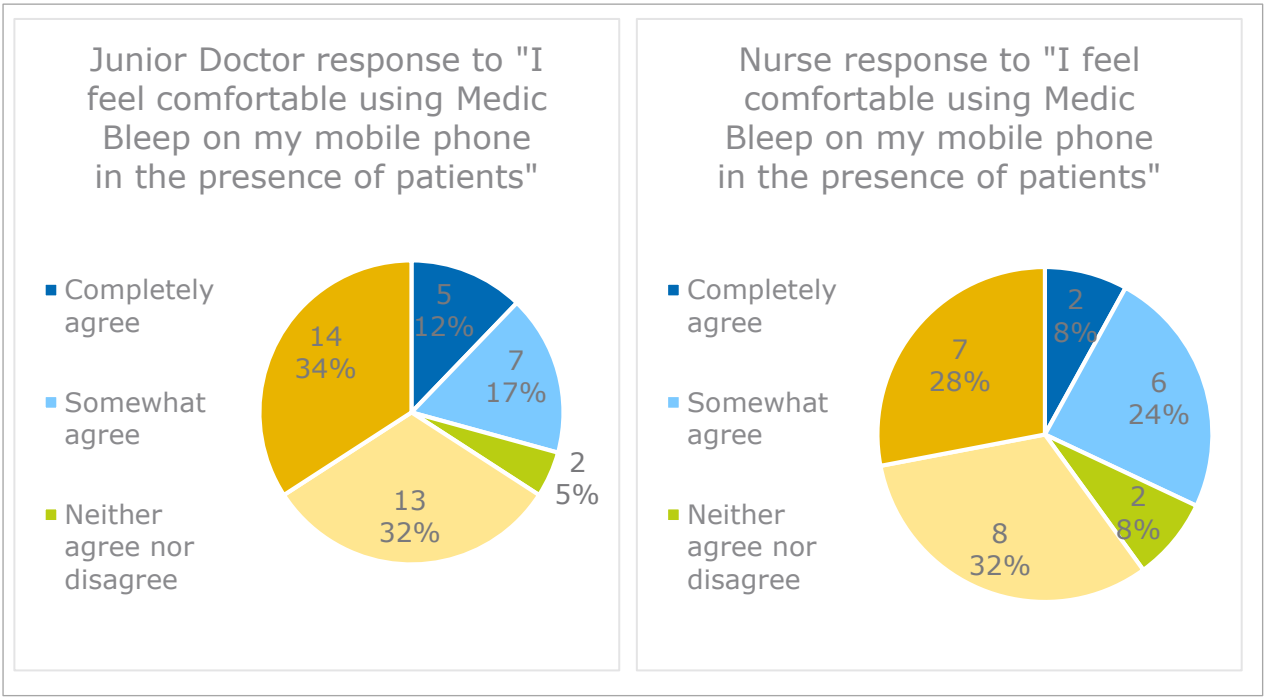


FIGURE 39 COMPARISON OF RESPONSES FROM JUNIOR DOCTORS AND NURSES TO THE SURVEY QUESTION "I FEEL COMFORTABLE USING MEDIC BLEEP IN THE PRESENCE OF PATIENTS"

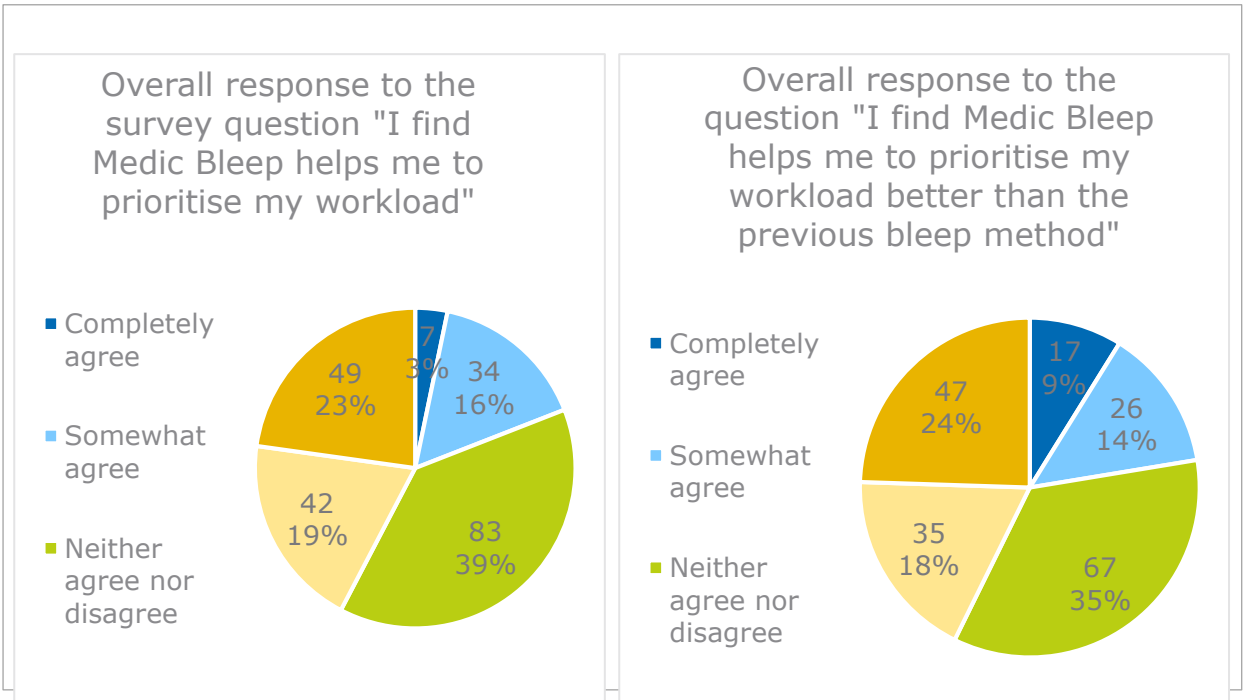


FIGURE 40 SURVEY RESPONSES ASSESSING WHETHER MEDIC BLEEP HELPS RESPONDENTS PRIORITISE THEIR WORKLOAD AND IN COMPARISON TO THE METHOD PRIOR TO ROLL OUT.

PERCEIVED EASE OF USE

There was near universal agreement on the overall ease of use with respect to Medic Bleep.

94% of all respondents either Completely Agreed or Somewhat Agreed with the statement "I understand how to use Medic Bleep." (Figure 41). The training appears to have been effective since 76% of all respondents either Completely Agreed or Somewhat Agreed with the statement "I found the learning curve for Medic Bleep short and simple." (Figure 42). Furthermore, the interface also appears to be intuitive since 88% of Nurses and 96% of AHPs either Completely Agreed or Somewhat Agreed with the statement "I find Medic Bleep easy to use." (Figure 43).

Their was mixed opinion on the ease of use compared to the previous bleep method as 100% of AHPs either Completely Agreed or Somewhat Agreed with the statement "I find Medic Bleep easier to use than the previous bleep method". In contrast only 22% of Senior Doctors Completely Agreed or Somewhat Agreed with the same (see Figure 44).

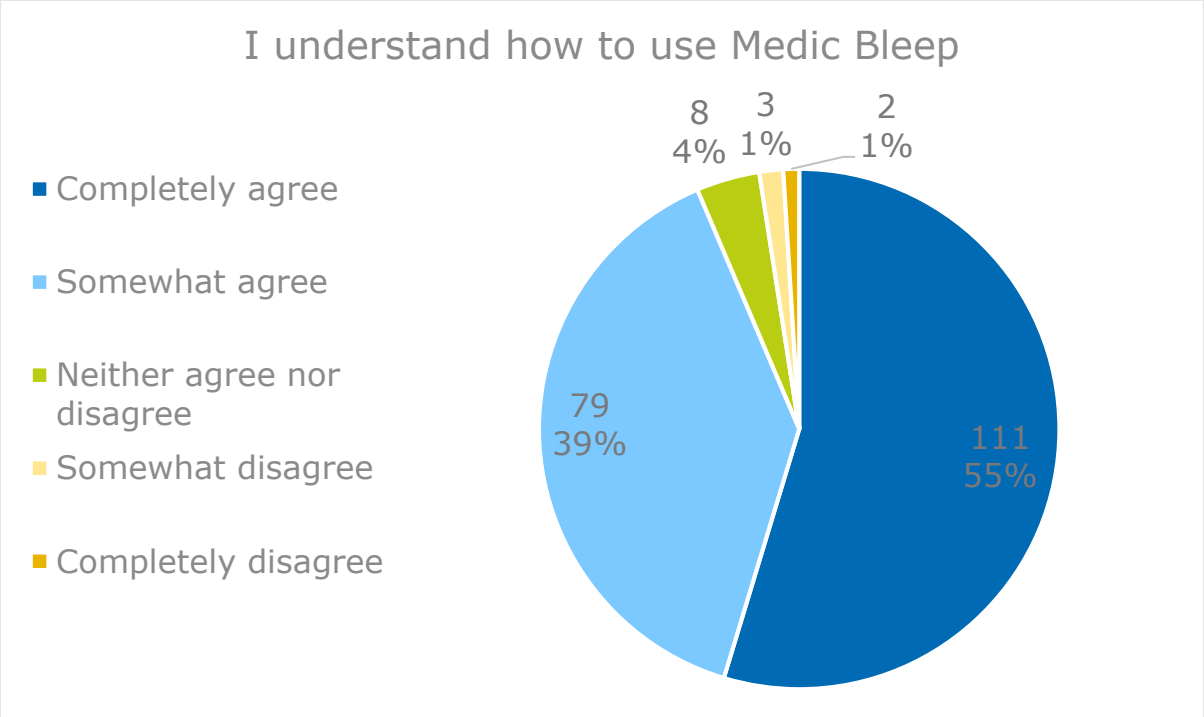


FIGURE 41 PIE CHART DEPICTING ALL RESPONSES TO SURVEY QUESTION "I UNDERSTAND HOW TO USE MEDIC BLEEP"

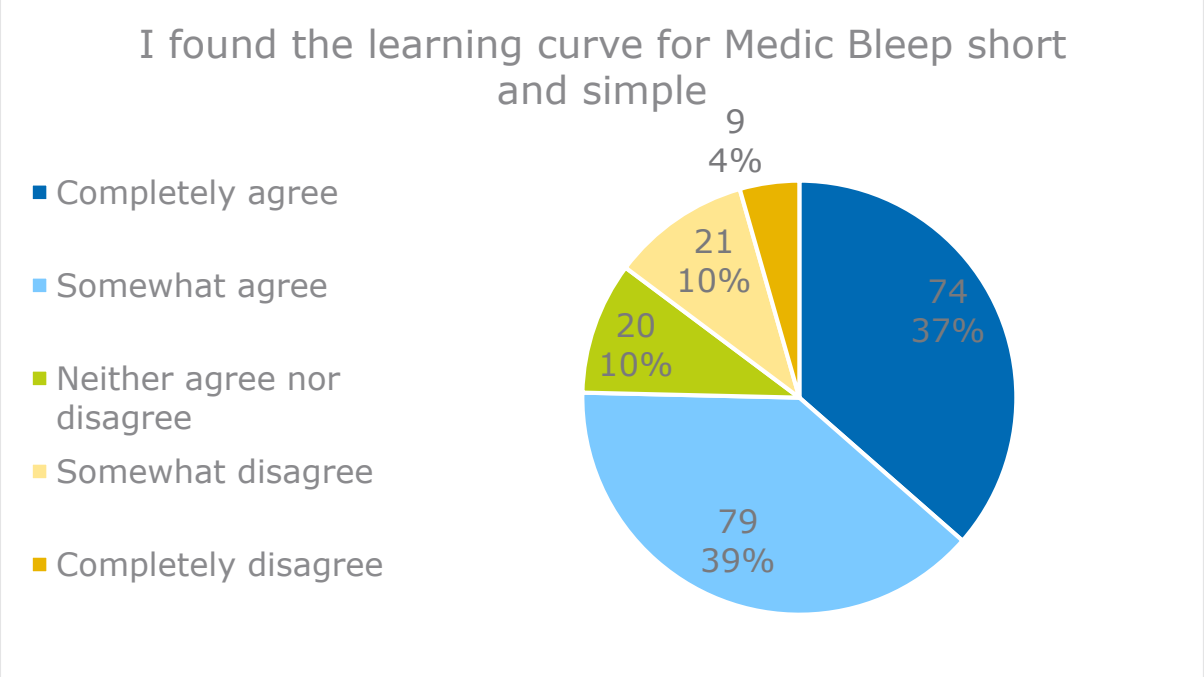


FIGURE 42 PIE CHART DEPICTING ALL RESPONSES TO SURVEY QUESTION "I FOUND THE LEARNING CURVE FOR MEDIC BLEEP SHORT AND SIMPLE "

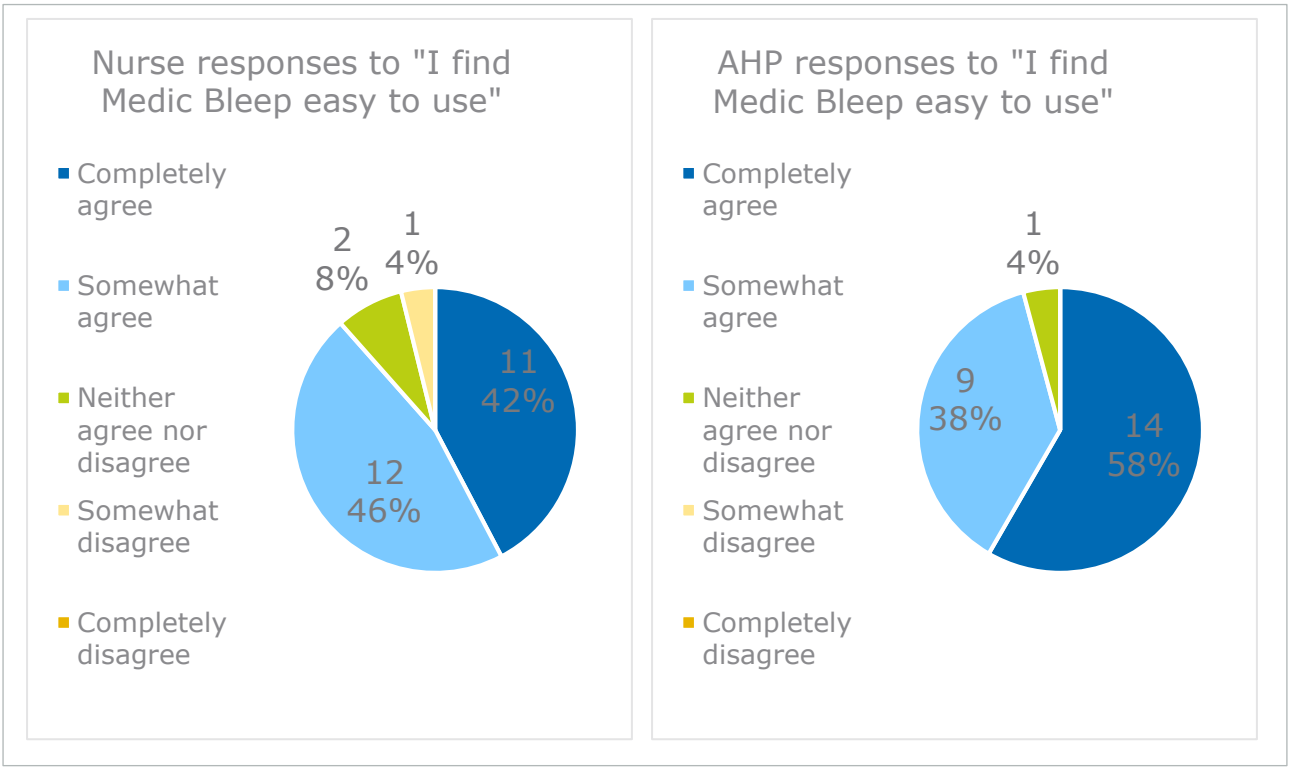


FIGURE 43 SURVEY RESPONSES FROM NURSES AND AHPS TO THE QUESTION "I FIND MEDIC BLEEP EASY TO USE"

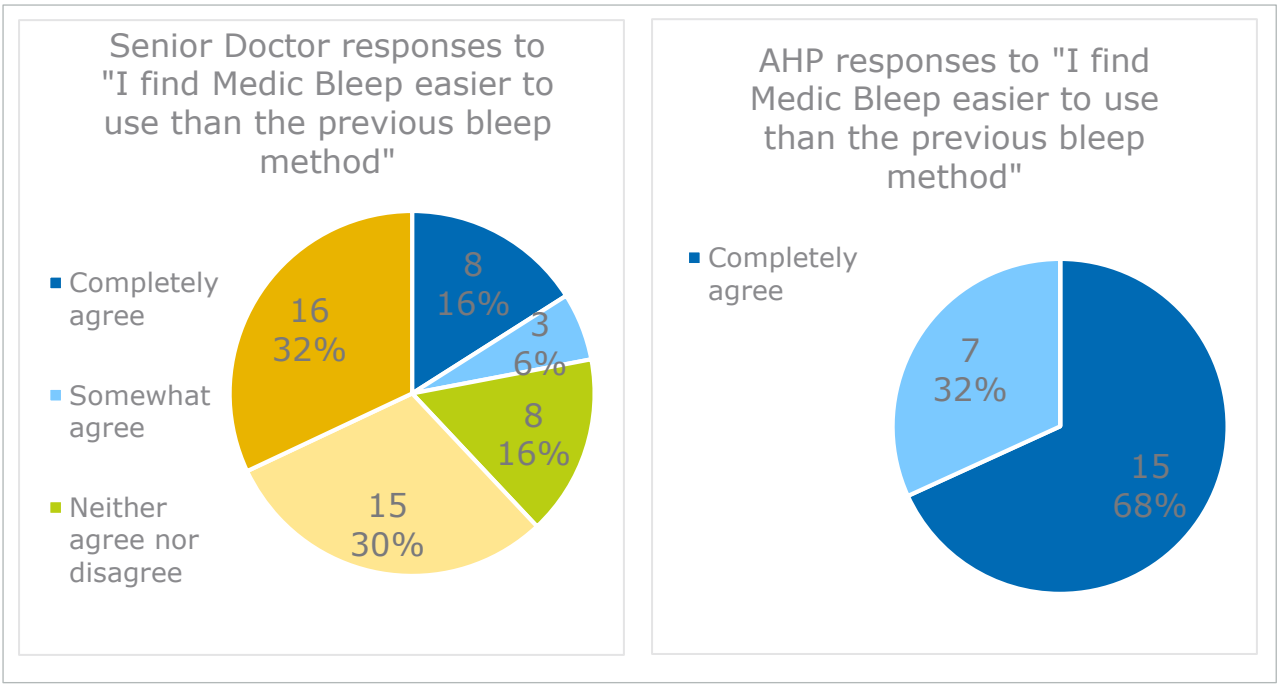


FIGURE 44 COMPARISON OF RESPONSES FROM SENIOR DOCTORS AND AHPS TO THE SURVEY QUESTION "I FIND MEDIC BLEEP EASIER TO USE THAN THE PREVIOUS BLEEP METHOD"

Qualitative Data

The survey also included qualitative questions looking for feedback on Medic Bleep and its role and usage within the hospital. The feedback responses, both positive and more critical were collated and grouped into response categories.

POSITIVE FEEDBACK

There were 213 separate items of feedback collected from responses to the open ended question "*What do you like about the Medic Bleep messaging system?*".

Perceived Usefulness

56% of the all feedback comments responses related to the perceived usefulness of Medic Bleep. The breakdown of positive feedback pertaining to the perceived usefulness is highlighted in Figure 45. The wide range of comments, some of which arguably overlap, highlight the range in functionality that respondents to the survey felt were worthy of praise in response to the question "What do you like about the Medic Bleep messaging system?".

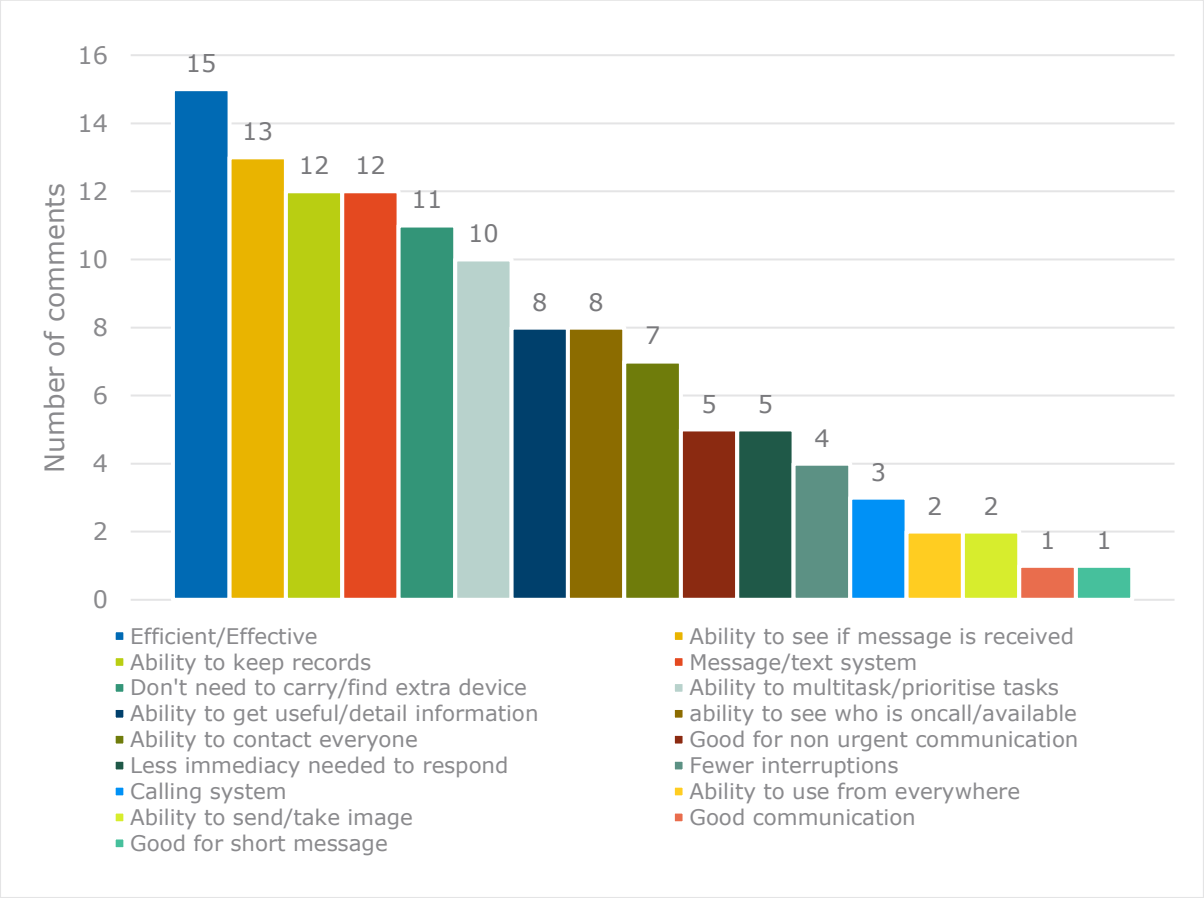


FIGURE 45 BREAKDOWN OF POSITIVE FEEDBACK PERTAINING TO THE PERCEIVED USEFULNESS OF MEDIC BLEEP.

Perceived Ease of Use

44% of the all feedback comments responses related to the perceived ease of use. These comments fell into two broad categories with 68 separate comments praising combinations of either "ease of use", "ease of access to colleagues" or "ease of communication". A further 26 comments praised the speed of being "able to access colleagues and communicate".

CRITICAL/CONSTRUCTIVE FEEDBACK

Feedback in response to the question "*What do you not like about the Medic Bleep messaging system?*" were collated and grouped into response categories and aligned to the themes of the Logic Model (Appendix A).

36% of the more critical feedback comments related to the **Training & Business Change Theme** of the logic model. The breakdown of these comments is shown in Figure 46. The most common view (34 comments) in this theme related to Inappropriate use of the messaging system, including sending "*unnecessary messages which interrupt clinical practice*", "*sending messages, rather reading clinical notes*" and "*when you are on call and in clinic/theatre, you don't want to finish every single referral and get 10 'thank you' messages"*. Other feedback related to usage in front of patients, which deemed to be unpopular with patients, which reinforces the quantitative data shown in Figure 39.

Training has been an important tool to create both a culture and business change by engaging the whole organisation to ensure adoption and understanding. Training has provided an opportunity to reinforce the benefits Medic Bleep offers as well as overcoming possible concerns by providing clarity to staff. Additionally, a forum for staff to share further feedback and comments on the functionality, such as the Do Not Disturb function which was subsequently implemented in Medic Bleep, helps to demonstrate that their feedback has been considered and implemented.

Other feedback related to Training included issues encountered during Handover, although some noted the situation had improved. Additionally there were a few (seven) comments citing Issues with Referrals and two regrading Litigation concerns, including the following comment:

"*Junior doctors will lose ability to make referrals properly which will have a whole generation of doctors who think it is normal to send a referral with just a hospital number. This is dangerous and not good for their education… certain users will send a message with patient's hospital number and accept this as a formal referral. If this is used as medical legal evidence, then we are playing a dangerous game with far greater consequences*".

An additional comment on the topic of litigation stated: "*We are concerned it would be used against us if there was a problem. i.e. message read and not responded".*

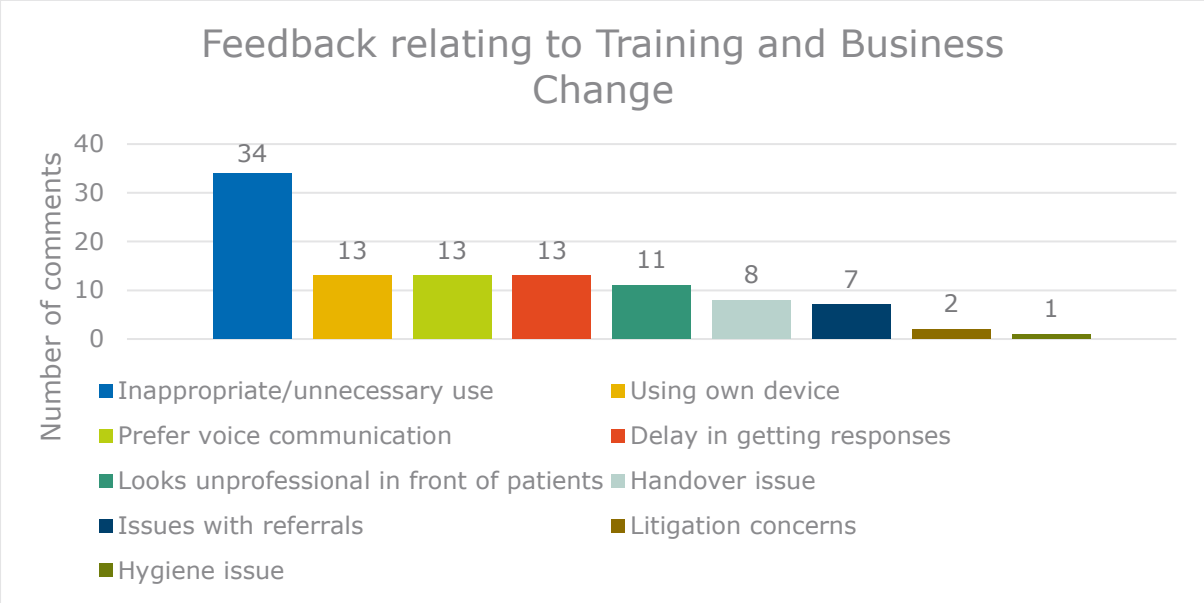


FIGURE 46 FEEDBACK RECEIVED THAT RELATES TO THE TRAINING AND BUSINESS CHANGE THEME OF THE LOGIC MODEL

The single underlying feedback comments relating to the **Infrastructure Theme** of the Logic Model concerned Connectivity issues. This feedback category received more comments (n=42) than any other in response to the survey question "*What do you not like about the Medic Bleep messaging system?*". Numerous comments refer to connectivity, for example: "*Inconsistent connection…leading to delays receiving messages*"

The breakdown of the feedback received related to the **Technology Theme** of the Logic Model is shown in Figure 47. The most common (n=27) comments in this category focussed on a lack of reliability, which is raising a barrier to usage adoption, with some respondents using mobile phone calls in preference to Medic Bleep to exchange information. The second most common comments related to having to log in more frequently than expected.

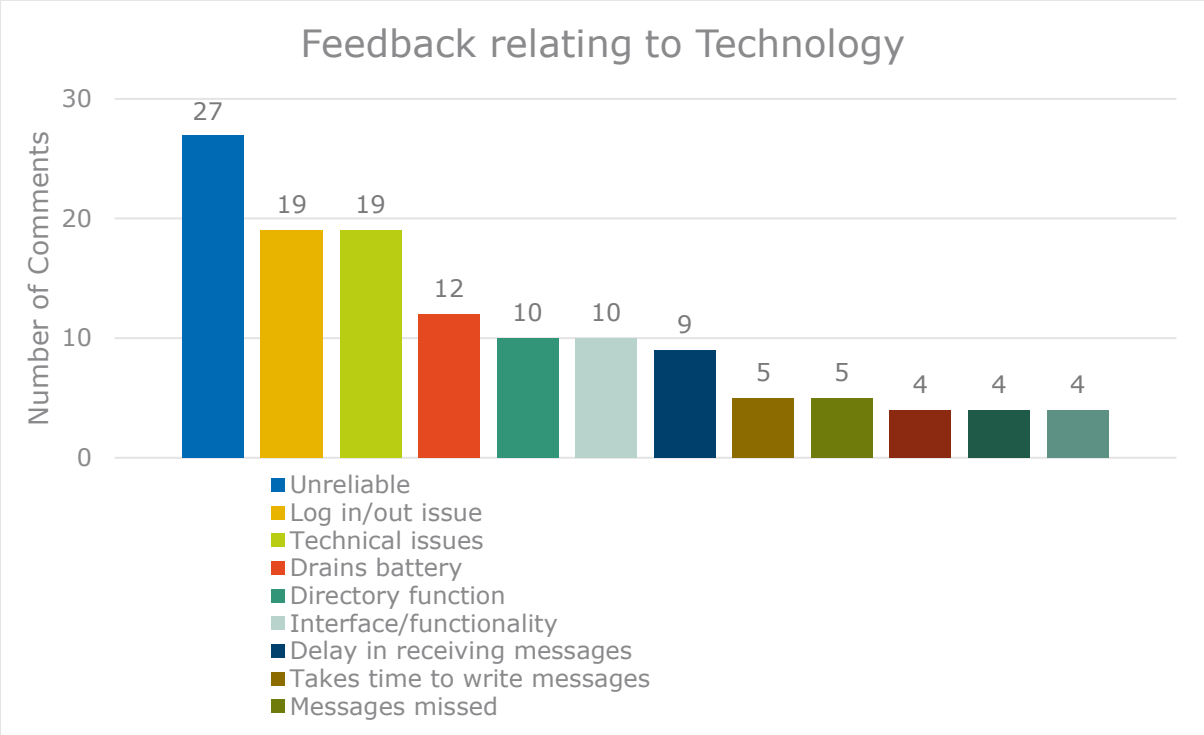


FIGURE 47 FEEDBACK RECEIVED THAT RELATES TO THE TECHNOLOGY THEME OF THE LOGIC MODEL

Additional feedback in response to the survey question, "*What do you not like about the Medic Bleep messaging system?*" fall into in the **Policy and Clinical Safety Theme** of the Logic Model, and focussed on either Safety Concerns (9 comments) and stating that Medic Bleep is not appropriate for "urgent cases" (5 comments). Feedback includes:

- *"Text messaging is a suboptimal way to communicate. Things get missed and mistakes can be made."*
- *"Delays in delivery/connectivity. In it's current state, the system is not safe."*
- *"I have frequently had situations where 5 or more messages from different times have been received at the same time. This has on two occasions resulted in a potentially clinically significant delay in attendance"*
- *"Overall, I think it is unsafe to completely rely on MedicBleep"*
- *"…too slow for urgent messaging esp in an acute specialty like anaesthesia"*

Perceived Usefulness/Ease of Use

Additional analysis of responses to the question "*What do you not like about the Medic Bleep messaging system?*" grouped the feedback into two categories: potential barriers to being useful (Figure 48) and potential barriers to ease of use (Figure 49), which highlight some of the obstacles to technology acceptance. Many of these barriers could be addressed with either additional training or technology development. Furthermore, as staff become familiar with the new communication method, some barriers may be overcome, or be less significant with time.

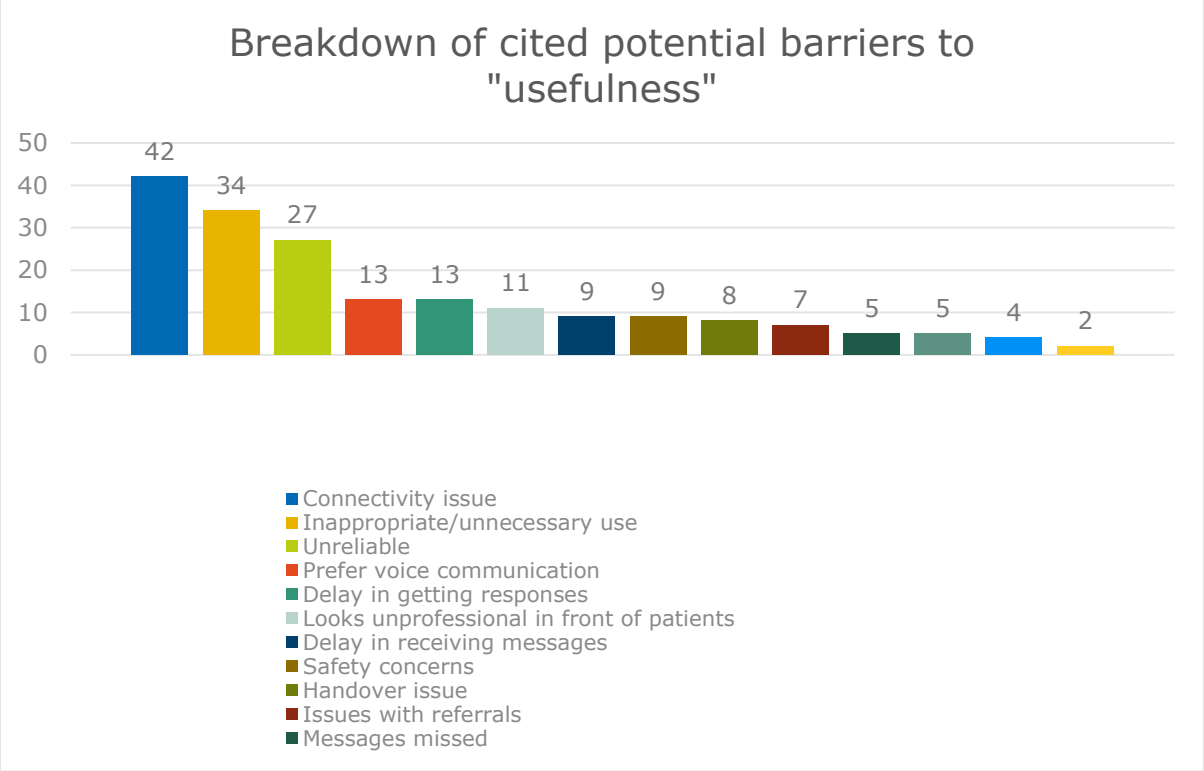


FIGURE 48 BREAKDOWN OF CITED POTENTIAL BARRIERS TO "USEFULNESS" AND TECHNOLOGY ACCEPTANCE.

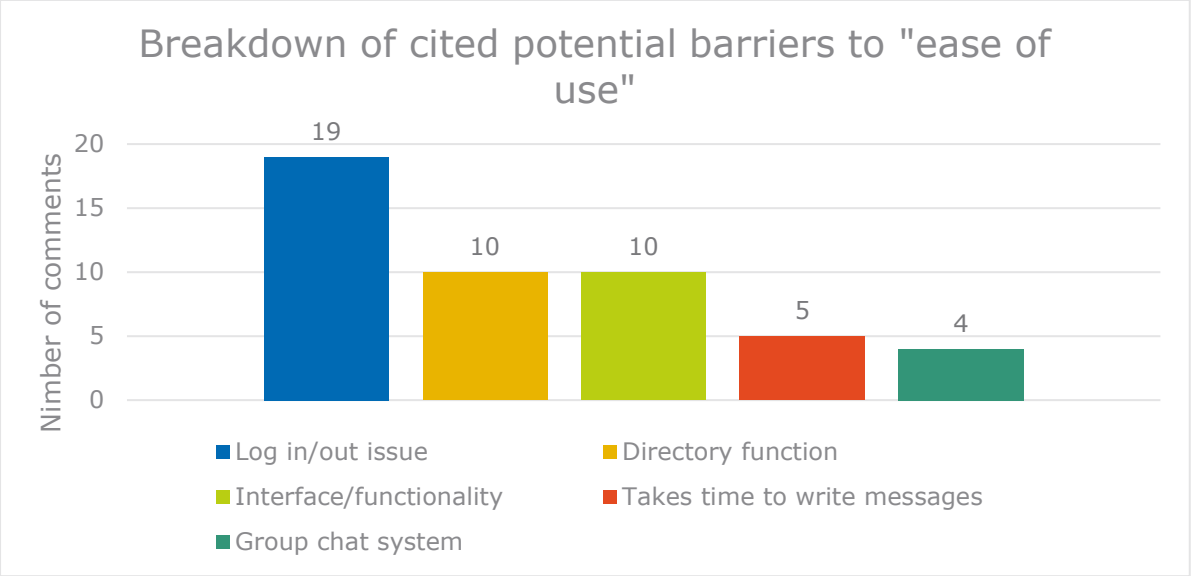


FIGURE 49 BREAKDOWN OF CITED POTENTIAL BARRIERS TO "EASE OF USE" AND TECHNOLOGY ACCEPTANCE.

Additional Data

Datix data

The Datix coordinator at WSH reported that there is no specific "communications" category within the Datix data set to enable a thorough search for baseline data (from Sept 2018) pertaining to communication issues. One incident from Sept 2018 (from a total of 500 reported) indicated that an on-call clinician did not "respond to numerous attempts to contact them". Similarly, in Sept 2019, there were only two incidents recorded which cited Medic Bleep.

Consequently, there is insufficient baseline data to directly compare any change in the number of clinical incidents reported on Datix that cite communications issues at the heart of the incident. This is largely because there is no "communications" category to facilitate a search for baseline data.

CQC Patient Surveys

The latest inpatient survey, carried out by patients at WSH[23], was published 20 June 2019. The survey was sent to 1,250 recent inpatients at WSH between August 2018 and January 2019 and 594 responses were received.

The period over which the data was collected was all prior to the roll out of Medic Bleep, however there is no specific question directly enquiring about communication efficiency between clinicians or operational staff.

The next patient survey data, covering the period post Medic Bleep is due to be published June 2020. This will cover the post Medic Bleep implementation period and could conceivably show changes in patient feedback in several areas, including waiting times and clinical staff acknowledging patients. Any changes could be due to the introduction of Medi Bleep, yet, with no questions particularly focussing on internal communications, it will be difficult to attribute any potential changes directly due to the introduction of Medic Bleep.

Conclusion

In a complex operational environment such as a district general hospital, it is difficult to determine that any one particular digital innovation is making a specific impact, particularly since West Suffolk Hospital is an NHS England Global Digital Exemplar with a stream of other digital initiatives being introduced.

Metrics were selected to try and demonstrate some benefits that may be apparent from the roll out of Medic Bleep, yet it has proven difficult to establish that any improvements are directly attributable to Medic Bleep.

Time and motion studies, as well a review of operational data before and after the roll out of Medic Bleep have proved to be inconclusive. Operational data and observations may have indicated some improvements to the baseline scenario when pagers were being used, yet other data shows no change or some deterioration and with so many external factors involved, it is very difficult to show causality. Consequently it has not been possible to develop any health economic evidence with robust methodology. A post implementation review of the nature and volume of calls to the switchboard was not carried out, which may have provided some evidence of savings.

The staff survey highlights the ease of use of the Medic Bleep platform, as well the short learning curve and positive feedback regarding the overall usability although opinions differ according to clinical discipline with nurses and AHPs being more favourable than senior doctors. A number of doubts have been expressed about using mobile phones in front of patients and feedback has also cited some connectivity and other technology issues which will likely be resolved as the implementation evolves, the product develops and matures and users become more familiar with the change to clinical communications. Finally a handful of comments were raised regarding the overall safety

[23] https://www.cqc.org.uk/provider/RGR/survey/3#undefined

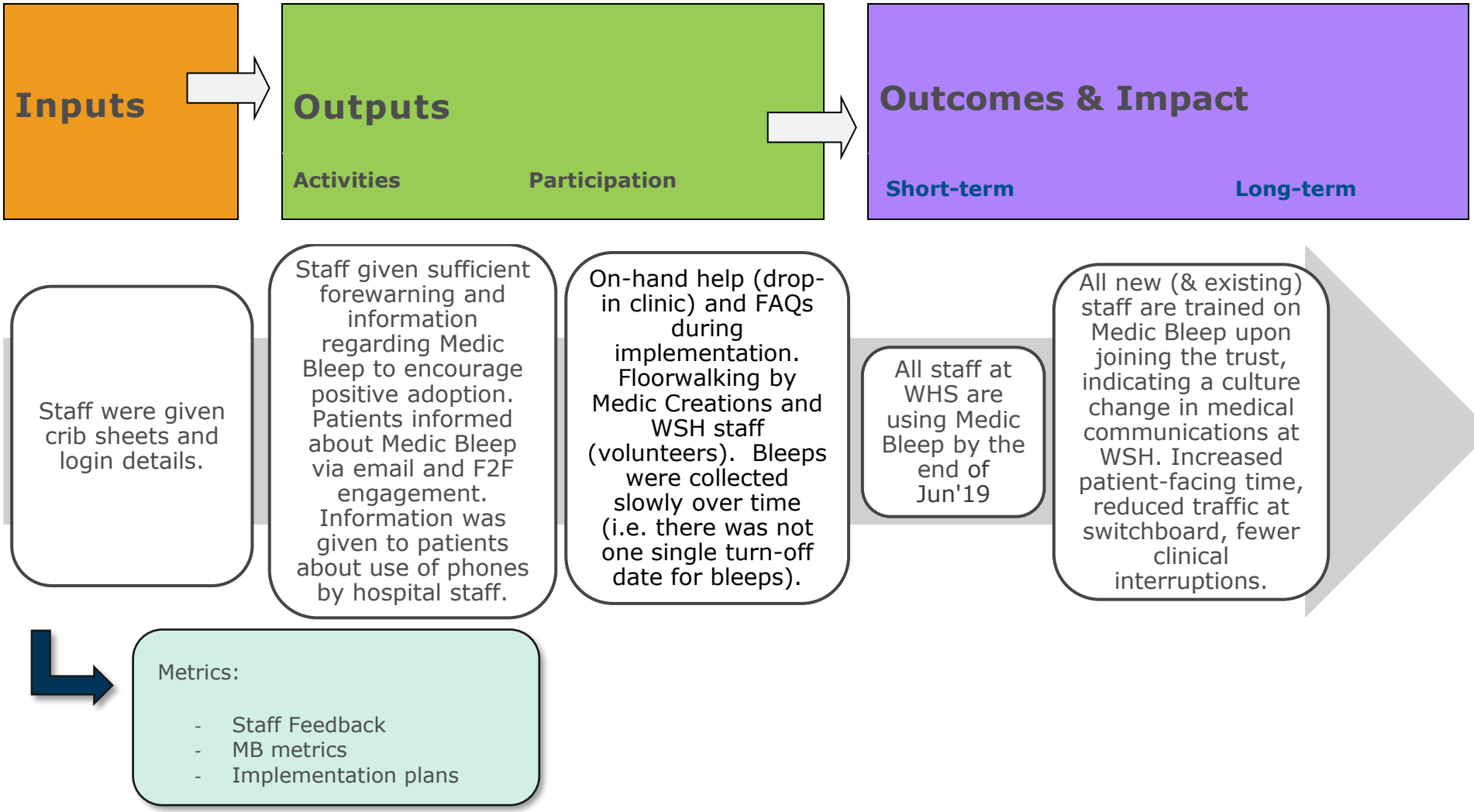
and it is vital that these concerns are addressed and steps taken to minimise and ultimately eliminate this risk.

Appendices

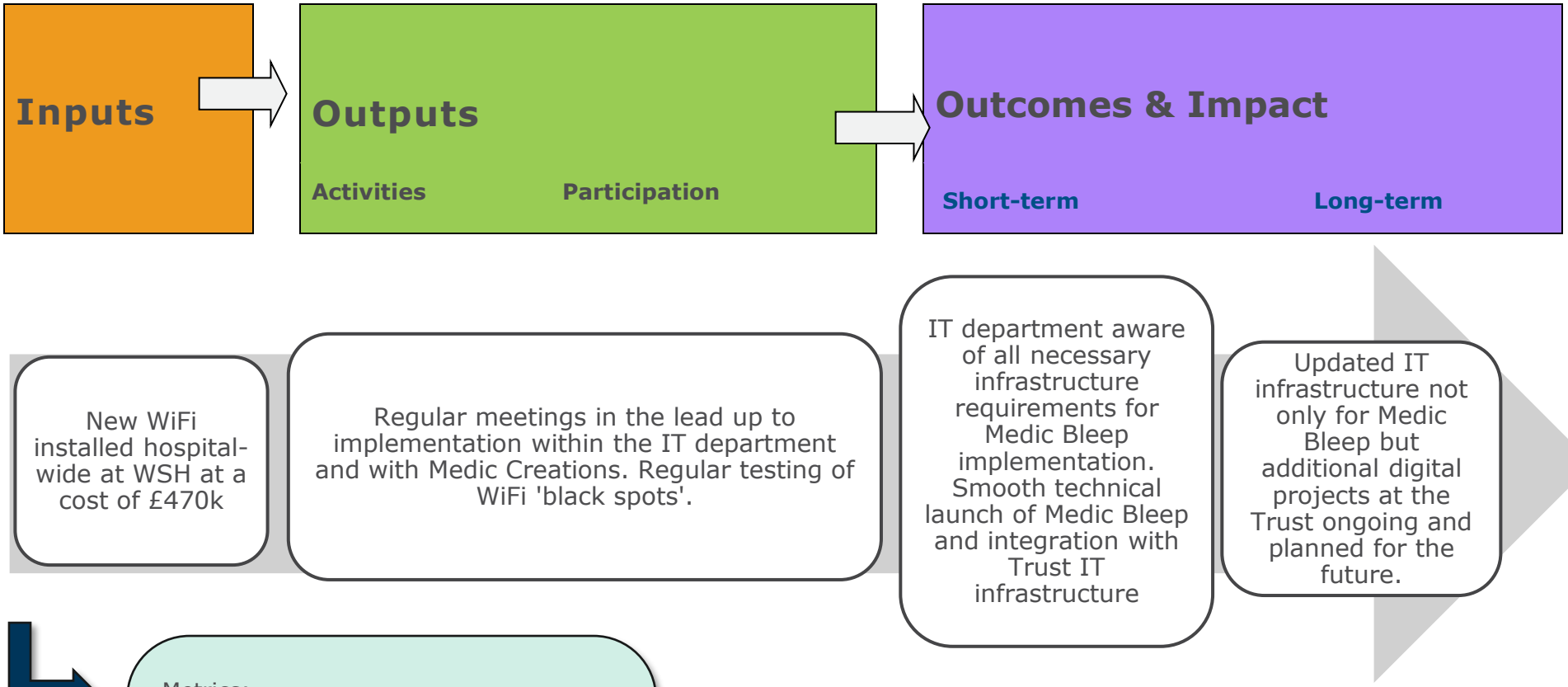
Appendix A - Logic Model Design

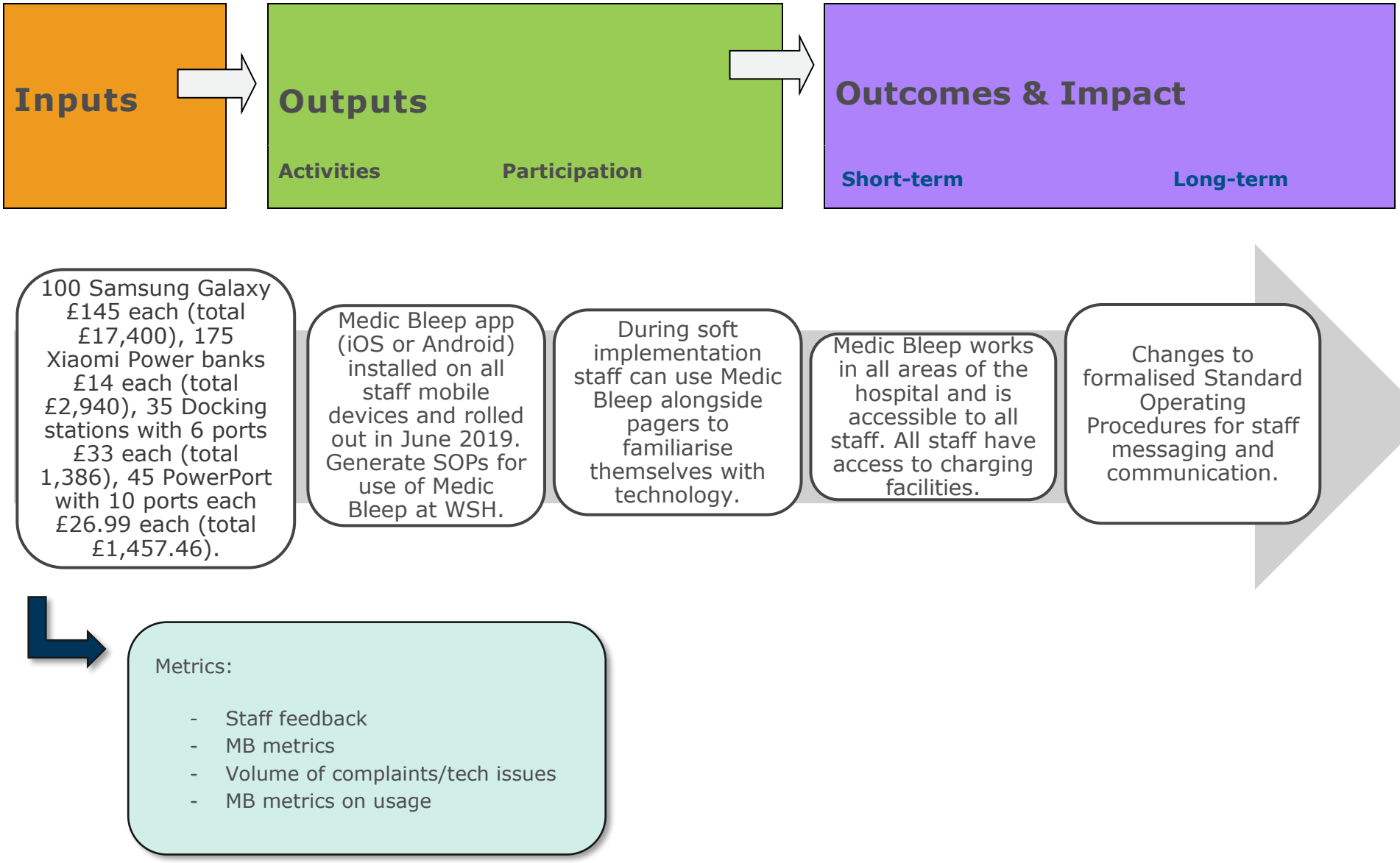
This logic model was designed by HEE with a set of desired outcomes from the perspective of WSH. HEE was contracted by the Eastern Academic Health Science Network (EAHSN) to carry out the evaluation of Medic Bleep using a range of qualitative and quantitative metrics.

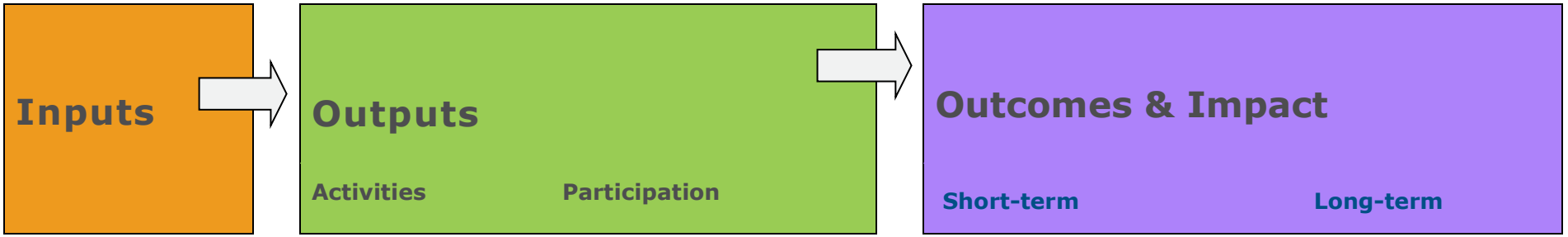
In creating the logic model, we invoked a methodology of working backwards; called Design Thinking. First the long-term impacts and desired outcomes were identified and then we asked what preconditions must be met to achieve this, and what resources are required to facilitate these? Outlined below the logic model is a clear set of assumptions and external factors which are critical to the success of the project and should be acknowledged, and addressed if possible, before the start of the roll-out.



TRAINING & CHANGE


Inputs
Outputs
Activities
Participation
Outcomes & Impact
Short-term
Long-term
2
New WiFi installed hospital-wide at WSH at a cost of £470k
Regular meetings in the lead up to implementation within the IT department and with Medic Creations. Regular testing of WiFi 'black spots'.
IT department aware of all necessary infrastructure requirements for Medic Bleep implementation. Smooth technical launch of Medic Bleep and integration with Trust IT infrastructure
Updated IT infrastructure not only for Medic Bleep but additional digital projects at the Trust ongoing and planned for the future.
INFRASTRUCTURE
Metrics:
-Staff feedback about Medic Bleep in general, with specific comments about BYOD (qualitative questionnaire)
-Medic Bleep metrics (messages sent/received)
-Frequency of complaints/technical issues


Inputs
Outputs
Activities
Participation
Outcomes & Impact
Short-term
Long-term
3
100 Samsung Galaxy £145 each (total £17,400), 175 Xiaomi Power banks £14 each (total £2,940), 35 Docking stations with 6 ports £33 each (total 1,386), 45 PowerPort with 10 ports each £26.99 each (total £1,457.46).
Medic Bleep app (iOS or Android) installed on all staff mobile devices and rolled out in June 2019. Generate SOPs for use of Medic Bleep at WSH.
During soft implementation staff can use Medic Bleep alongside pagers to familiarise themselves with technology.
Medic Bleep works in all areas of the hospital and is accessible to all staff. All staff have access to charging facilities.
Changes to formalised Standard Operating Procedures for staff messaging and communication.
TECHNOLOGY
Metrics:
- Staff feedback
- MB metrics
- Volume of complaints/tech issues
- MB metrics on usage



4

Dedicated time from key players to facilitate roll-out. Briefing of heads of wards/departments and control centres by Medic Creations and WSH ops team.

Regular meetings to decide upon logistics and metrics. Key figures within the hospital briefed on detailed plan for roll-out. Development of a new set of SOPs for comms with Medic Bleep.

Operational leads to meet with heads of department/wards and key members of staff regularly to ensure business continuity.

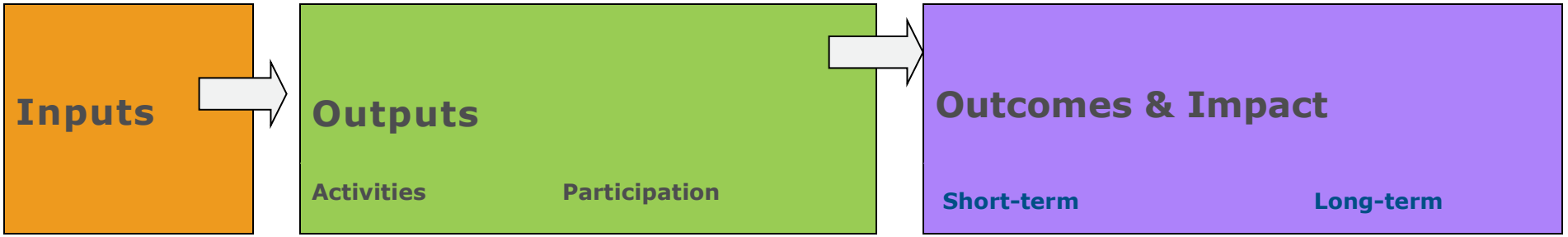
Efficient timely implementation and adoption of Medic Bleep throughout the Hospital by June'19.

Ongoing support for Medic Bleep users. Reduction in switchboard traffic due to pagers, more efficient comms services. Audit trail of communications. More efficient comms and therefore patient care; leading to shorter length of stay, fewer clinical errors, reduced TTO, increased discharge rate, increased patient-facing time.

BUSINESS CONTINUITY

Metrics:

- SB traffic
- Staff feedback
- PROMS (patient feedback)
- e-care and T&M data



5

WSH mobile device policy agreed upon and finalised (BYOD). Appropriate messaging rules and regulations. Guidelines on messages is clear.

Hazards and risks associated with the project are identified and actions taken to minimise them. Essential bleeps are kept (crash teams/rapid response teams).

The trust's Clinical Safety Officer audit of Medic Bleep in use to assure clinical safety. Regular check and feedback required to ensure safe delivery of project throughout.

Robust contingency plan during implementation and phasing out of Medic Bleep, including keeping old bleeps in case of WiFi blackout.

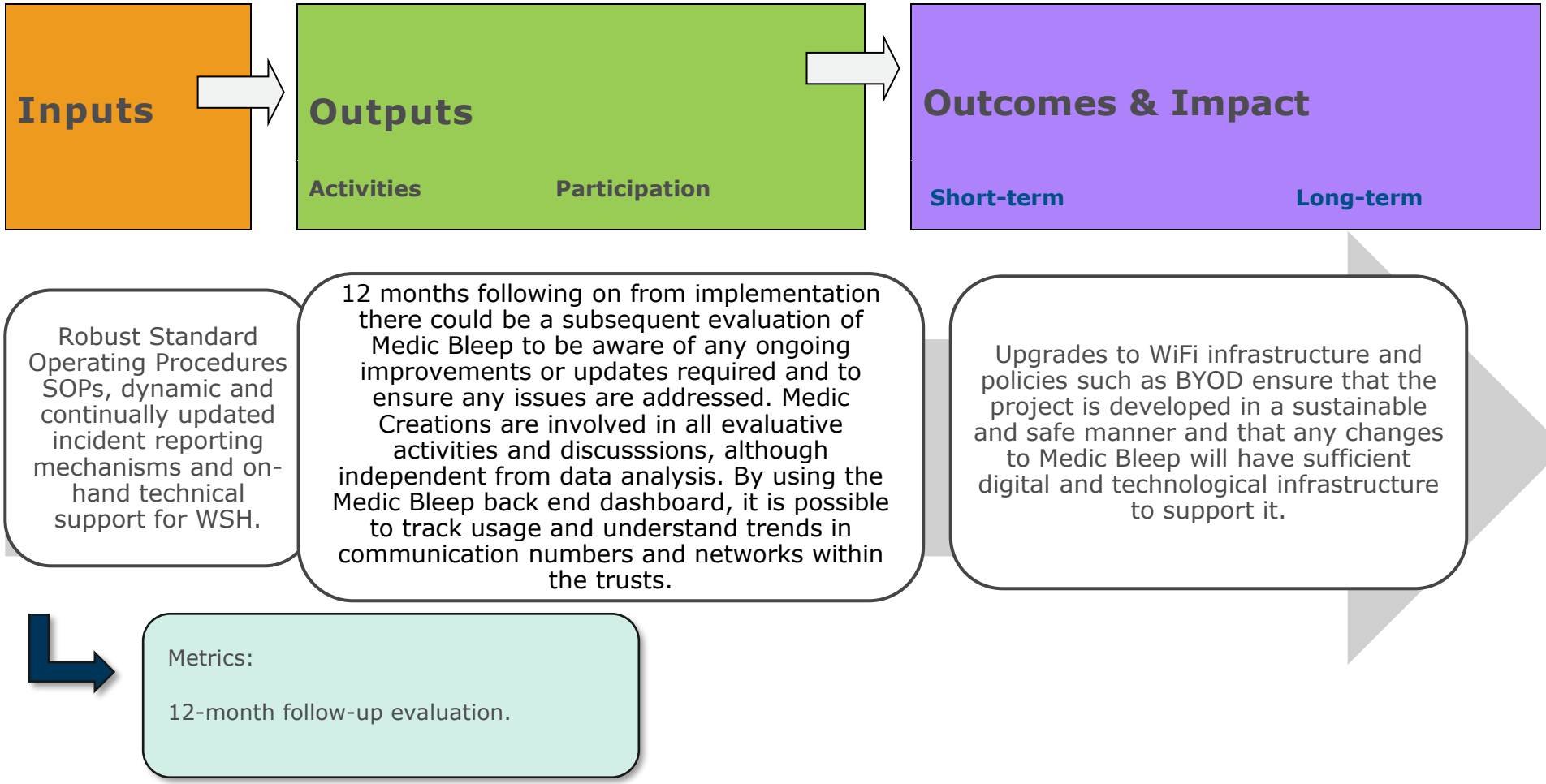
Safe and effective roll-out of Medic Bleep which is accessible to all staff and compliant with the hospital's policy. The roll out has an indirect effect on patient care and communications. A robust BYOD policy implemented at the Trust for this and future digital projects.

POLICY AND SAFETY

Metrics:

- Adverse events (Datix)*

**No baseline*


Inputs
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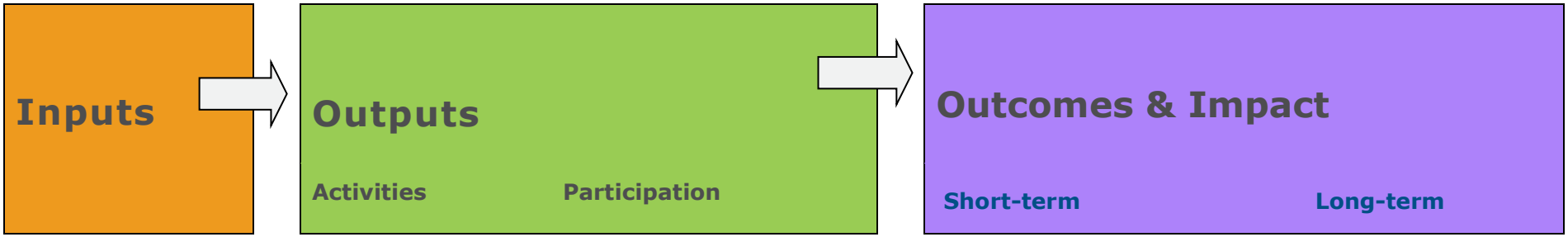
Outcomes & Impact
Short-term
Long-term
6
Robust Standard Operating Procedures SOPs, dynamic and continually updated incident reporting mechanisms and on-hand technical support for WSH.
12 months following on from implementation there could be a subsequent evaluation of Medic Bleep to be aware of any ongoing improvements or updates required and to ensure any issues are addressed. Medic Creations are involved in all evaluative activities and discusssions, although independent from data analysis. By using the Medic Bleep back end dashboard, it is possible to track usage and understand trends in communication numbers and networks within the trusts.
Upgrades to WiFi infrastructure and policies such as BYOD ensure that the project is developed in a sustainable and safe manner and that any changes to Medic Bleep will have sufficient digital and technological infrastructure to support it.
SUSTAINABILITY
Metrics:
12-month follow-up evaluation.



7

Implementation of Medic Bleep end Jun. HEE to collect T&M data and other agreed upon metrics.

Data collection: Time & motion studies, collection of data from clinical IT systems, qualitative assessments.

Staff from HEE & IT Healh Partnership for T&M analysis in 2 operational areas in 4 days pre- and post-implementation of Medic Bleep . WSH IT to provide clinical data. Medic Bleep to provide app metrics, if required.

A comprehensive database of qualitative and quantitative data to assess the impact of MedicBleep.

An independent assessment of the effect of Medic Bleep at WSH, including any time savings, cash releasing and non-cash releasing benefits. Qualitative feedback about Medic Bleep and its implementation.

EVALUATION

Metrics:

- T&M
- TTO
- Discharge before 11am
- Length of Stay (LoS)
- Switchboard traffic
- Adverse events (Datix)*
- e-care data
- Staff survey.

**No baseline*

Appendix B – Staff Survey

Medic Bleep Questions

Please score the following statements on how much you agree, using a scale of 1–5:

1= Completely disagree,

2 = Somewhat disagree,

3 = Neither agree nor Disagree,

4= Somewhat agree and

5 = Completely agree.

Usefulness

Performance and Productivity in your role (*i.e.* your ability to accomplish tasks more effectively and efficiently).

My Job Role is:

I find Medic Bleep effective in getting a response

1. Complete disagree	2. Somewhat disagree	3. Neither agree nor disagree	4. Somewhat agree	5. Completely agree

I find Medic Bleep more effective in getting a response than the previous bleeper method

1. Complete disagree	2. Somewhat disagree	3. Neither agree nor disagree	4. Somewhat agree	5. Completely agree

I find Medic Bleep effective when responding to messages

1. Complete disagree	2. Somewhat disagree	3. Neither agree nor disagree	4. Somewhat agree	5. Completely agree

Using Medic Bleep interrupts my work on a regular basis.

1. Complete disagree	2. Somewhat disagree	3. Neither agree nor disagree	4. Somewhat agree	5. Completely agree

When my work is interrupted by Medic Bleep, I am more likely to make a mistake.

1. Complete disagree	2. Somewhat disagree	3. Neither agree nor disagree	4. Somewhat agree	5. Completely agree

When I bleep or call someone, I usually get a response within....

0-1 minutes	1-5 minutes	5-10 minutes	10-30 minutes	30-60 minutes	60+ minutes

I find Medic Bleep helps me to prioritise my workload

1. Complete disagree	2. Somewhat disagree	3. Neither agree nor disagree	4. Somewhat agree	5. Completely agree

I find Medic Bleep helps me to prioritise my workload better than the previous bleeper method

1. Complete disagree	2. Somewhat disagree	3. Neither agree nor disagree	4. Somewhat agree	5. Completely agree

I frequently need to make a call to clarify messages sent/received in Medic Bleep

1. Complete disagree	2. Somewhat disagree	3. Neither agree nor disagree	4. Somewhat agree	5. Completely agree

I make calls via Medic Bleep rather than using the phone

1. Complete disagree	2. Somewhat disagree	3. Neither agree nor disagree	4. Somewhat agree	5. Completely agree

Overall, I am very satisfied with Medic Bleep

1. Complete disagree	2. Somewhat disagree	3. Neither agree nor disagree	4. Somewhat agree	5. Completely agree

Please clarify why you gave this response

A significant proportion of my day is spent trying to get hold of other members of staff.

1. Complete disagree	2. Somewhat disagree	3. Neither agree nor disagree	4. Somewhat agree	5. Completely agree

Patients are often left waiting to be discharged due to inefficient communications

1. Complete disagree	2. Somewhat disagree	3. Neither agree nor disagree	4. Somewhat agree	5. Completely agree

I feel stressed when working due to the Medic Bleep communication method.

1. Complete disagree	2. Somewhat disagree	3. Neither agree nor disagree	4. Somewhat agree	5. Completely agree

I frequently have to contact switchboard to get hold of someone, or because Medic Bleep is not working

1. Complete disagree	2. Somewhat disagree	3. Neither agree nor disagree	4. Somewhat agree	5. Completely agree

Average number of Medic Bleep messages received per day

Average number of Medic Bleep messages sent per day

How long, on average, per day, do you spend sending, receiving and waiting for responses to messages on Medic Bleep?

sending

receiving

waiting for responses to messages on Medic Bleep?

<u>Ease of Use:</u>

I find Medic Bleep easy to use

1. Complete disagree	2. Somewhat disagree	3. Neither agree nor disagree	4. Somewhat agree	5. Completely agree

I find Medic Bleep easier to use than the previous bleep method

1. Complete disagree	2. Somewhat disagree	3. Neither agree nor disagree	4. Somewhat agree	5. Completely agree

I found the learning curve for Medic Bleep short and simple

1. Complete disagree	2. Somewhat disagree	3. Neither agree nor disagree	4. Somewhat agree	5. Completely agree

I understand how to use Medic Bleep.

1. Complete disagree	2. Somewhat disagree	3. Neither agree nor disagree	4. Somewhat agree	5. Completely agree

General Feedback

What do you like about the Medic Bleep messaging system?

What do you not like about the Medic Bleep messaging system?

I prefer Medic Bleep to the previous bleeper method

1. Complete disagree	2. Somewhat disagree	3. Neither agree nor disagree	4. Somewhat agree	5. Completely agree

I would recommend Medic Bleep to colleagues at other hospitals.

1. Complete disagree	2. Somewhat disagree	3. Neither agree nor disagree	4. Somewhat agree	5. Completely agree

I feel comfortable using Medic Bleep on my mobile phone in the presence of patients.

1. Complete disagree	2. Somewhat disagree	3. Neither agree nor disagree	4. Somewhat agree	5. Completely agree

Appendix C – Full Staff Survey Responses

See separate Excel file with full survey responses