BMJ Open Quality

‘I’ve got a little list’—the scourge of a surgical junior. A quality improvement project to change the surgical patient list in a district general hospital

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To cite: Khan H, Flesher E, Marshman J, *et al*. ‘I’ve got a little list’—the scourge of a surgical junior. A quality improvement project to change the surgical patient list in a district general hospital. *BMJ Open Quality* 2020;**9**:e000829. doi:10.1136/bmjoq-2019-000829

► Additional material is published online only. To view please visit the journal online (http://dx.doi.org/10.1136/bmjoq-2019-000829).

Received 22 September 2019
Revised 19 April 2020
Accepted 11 May 2020

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ABSTRACT

Background Junior doctors at the Royal Devon and Exeter Hospital spend hours every day creating and updating patient lists for all surgical specialties on Microsoft Excel spreadsheets. This not only consumes time that should be spent on clinical tasks, it allows for human errors, system errors and patient safety concerns. Our aim was to reduce time spent on the list and reduce the chance for error.

Methods We measured the time junior doctors spent creating and updating the surgical lists for one specialty, and on-call shifts. Our first Plan-Do-Study-Act (PDSA) cycle was to introduce clinical secretaries; this reduced the time spent by ward teams on the list but had no effect on the on-call team. We then worked with the hospital application developer to adapt software currently used to suit all surgical teams. Once completed, this software was rolled out alongside the existing spreadsheet method with a view to a switch after a transition period.

Results The introduction of clinical secretaries reduced the time spent on the colorectal surgery list from 99.22 min a day to 43.38 min. The on-call team however did not benefit from this intervention. Following the introduction of the new software, the day on-call team time spent on the list changed from 121 min a day to 4.66 min. The night on-call team time changed from 91 min to 7.38 min.

Conclusion Reducing the time juniors spend compiling surgical lists has clear benefits to patients with extra time for junior doctors to clerk patients. The use of an automated system removes the chance of error in transcription of blood results. Due to the success of this project, colorectal, upper gastrointestinal, urology, vascular and on-call teams have adopted the new list permanently.

PROBLEM

The Royal Devon and Exeter Hospital (RD&E) is an 875-bed district general hospital with some tertiary surgical services. One hundred and sixteen surgical junior doctors work across general, vascular and urology. Junior doctors are doctors below consultant level and therefore include newly trained doctors and those at all stages of their training. The surgical list is often the responsibility of newly qualified doctors. Surgical junior doctors spent between 2 and 4 hours every day creating and updating the surgical lists on Microsoft Excel spreadsheets for ward rounds (online supplementary figure 1).

Once a surgical patient was admitted, it was a junior doctor’s task to manually input patient details, presenting complaint, pending tests, blood and scan results and keep their bed and ward location updated.

There is clearly much scope for human error as well as unnecessary time spent during this process which can often result in the following.

- Patients missed off the list and therefore missed on ward rounds.
- Incorrect patient identifiers.
- Incorrect blood results influencing clinical decision making.
- The Excel spreadsheet cannot be edited by more than one person at a time.
- The bed locations are often incorrect on a morning ward round if a patient has moved ward or bed space overnight.
- Excessive time spent on the list by junior doctors.
- Long patient waiting times before they can be seen as the junior doctor needs to spend time on the list.

As part of the Quality Improvement Academy scheme at the hospital our group of Foundation Year 1 doctors strongly felt that the current practice not only affected patient safety but wasted a lot of surgical junior time.

Smart aim

To reduce the time spent on the list by surgical junior doctors at the Royal Devon and Exeter Hospital by 50% from September 2018 to May 2019.

BACKGROUND

All surgical specialties at the Royal Devon and Exeter Hospital managed their inpatient

load on manually updated Microsoft Excel spreadsheets; requiring patient details to be entered on admission. In addition to the time requirement there is a large scope for human error with the manual transcription of vital information. Surgical patients are frequently moved due to bed availability and the need to make space in particular wards. The Excel spreadsheet lists would then have incorrect information for patient location resulting in 'lost' patients, and has led to patients not being reviewed for several days.

Transcription errors have been identified as a common contributor to surgical never events,[1] where transcription or input errors have been then copied to all other documentation, ending up on theatre list records which gives a potential avenue for never events such as wrong site surgeries. Other examples of transcription errors include blood results incorrectly inputted which could result in over or undertreatment of the patient. Not treating a patient with the antibiotics they need could lead to sepsis and death. Furthermore, omission of allergies could result in anaphylaxis and transcription errors leading to omission of a patient from the list would lead to patients not being seen, diagnosed or treated which could also lead to fatalities. All of these are never events which are wholly preventable patient safety incidents. There is good evidence for a reduction in transcription errors and other human errors in electronically generated prescribing systems.[2 3] However there is unfortunately little evidence available for using similarly automated software for managing patient lists. Electronic automated patient lists are however in use across other hospitals in surrounding trusts.

The other key concern is around data protection. Though we know that hospital-wide software is encrypted and therefore suitable for storage of patient data, the Excel spreadsheets were all saved onto a hospital drive. Furthermore, most of the hospital software used at the Royal Devon and Exeter Hospital stores patient data only while they are inpatients and the data are subsequently erased on discharge. Conversely, the Excel surgical list spreadsheets remain on the computer system long term and it is unclear when or how they are deleted. Furthermore, they may contravene the General Data Protection Regulations or breach any NHS data protection laws for the following reasons.

1. No encryption of the patient data on the Excel spreadsheets.
2. No direct consent from patients to allow their data to be put onto Excel spreadsheets.
3. No clear pathway for duration of storage and deletion of data.
4. We do not know how many people have access to this drive.

MEASUREMENT

Data collection was to record the time taken for junior doctors to compile and update the surgical lists in preparation for handover (online supplementary figure 2).

Two types of lists were identified.

1. Ward lists—these are lists of the surgical inpatients on hospital wards who are reviewed by each surgical firm on a daily basis.
2. On-call lists—these lists are created from all patients accepted onto the acute surgical unit on any given day and will consist of patients who are not yet ready to be referred to a specialty firm.

Junior doctors on their surgical firms were made aware of the project and were asked to monitor how long they took to create and update the list for each shift. A table was put in the doctors' office, where the surgical juniors could document the length of time they had taken on the list. The table was simple as it just had the date the data were to be collected on and a column for the time taken to create and update the surgical list for both on-call teams and the specific specialty teams. The initial PDSA cycle aimed at improving the time spent on ward lists and this was modelled using the colorectal team ward lists. Following this cycle,the on-call lists create the most amount of work compared with individual specialty lists and hence were the focus of the project.

Data were collected between November 2016 and May 2019 throughout eight PDSA cycles.

DESIGN

Team

Our team consisted of Foundation Year 1 doctors (newly qualified doctors) mentored by a Foundation Year 2 doctor (second year doctor) and a Quality Improvement Fellow. The group had the support of a surgical consultant. We continued the work previously completed by other junior doctors. The hospital applications developer conducted the building and design of the new software. All doctors worked at the Royal Devon and Exeter Hospital.

Rationale

We decided to change the surgical list set up after regular complaints from the surgical junior doctor staff and patient safety events and near misses occurring. The rationale behind this change grew from the frustration of surgical junior doctors who felt that they were spending too much time creating the surgical lists; time that they could have been spending on clinical work. With so much junior doctor time spent on administrative work we also believed that there could be a significant reduction in costs to the trust if this system was improved. Other hospitals use software to generate their surgical lists for example, Bristol Royal Infirmary and MyComm. Our hypothesis was that converting simple processes such as patient details configuration and blood results displayed into automated processes would not only save significant junior doctor time but also reduce the risk of patient safety errors.

Predicted problems

- Agreement to trial the list by senior consultants who were used to longstanding list layout.
- Agreement by junior doctors to trial both lists at the same time as this increased short-term workload.
- All current list specifications may not be transferable to the software.
- The new list may not be acceptable to all surgical juniors.

METHODS

General surgical junior doctors were asked to time themselves creating and updating the current patient lists during days on the ward and on-call. A simple table with two rows was used to aid data collection. This was pinned to the surgical ward office doors and the wall in the office on the acute surgical unit. These sheets were replaced every week with data collected and stored on a central database. Some of these data were collected by members of our team.

PDSA 1

Following a demonstration to management of the time taken to populate the lists, the clinical secretaries were introduced and juniors continued to collect prospective data. Clinical secretaries were employed to update the non-clinical aspects of the lists such as patient location, generic patient details and blood results. We will not be discussing this PDSA cycle in depth in this paper in order to focus on the software implementation quality improvement processes and to ensure that this paper remains at an acceptable length.

PDSA 2

The introduction of the secretaries did not provide a benefit to the on-call team. This led to junior doctors meeting with the hospital applications developer with the aim of transferring as many functions as possible from the current Excel spreadsheet list to automated software.

The following criteria were presented to the IT department as an essential component of the new system.

- Patient details (name/hospital number).
- Admission date.
- Ward and bed space.
- Presenting complaint.
- Medical history.
- Investigations.
- Plan of action.
- Blood results up to 72 hours.

Once the new list (online supplementary figure 3) had been coded we asked junior doctors to trial both lists together and time how long the new list took to create and update. Planned feedback sessions were held to guide further improvement of the software before changing practice to the new software once possible. Once the usability and acceptability of the new electronic system was established, data were collected to assess the effect of the introduction of this new system.

Sustainability

Hospital management had agreed to continue to fund the positions of clinical secretaries if a measurable difference was made to the time spent on the lists and informal qualitative feedback was positive. This was demonstrated and so the roles of the clinical secretaries were rolled out.

For the introduction of the new IT system, the costs were reduced due to the ability of the in-house IT department to create the software. The list was developed from an already existing software which further reduced time required to create the electronic list. Once this was created, it required little on-going input for IT and therefore has been a sustainable change. The various iterations of the list were supported by hospital management following a recognition of the problem trying to be fixed by surgical juniors.

Ongoing user engagement, junior doctors education and a new teaching session as part of junior doctor induction have all been part of our sustainability plan. All junior doctors at the hospital have been trained on how to use the software and all new doctors joining the trust will be shown during mandatory shadowing days prior to their first working day at the hospital in addition to the new doctor induction training. We have also created a visual onboarding document that is sent to new junior doctors by email (online supplementary figure 4).

STRATEGY

Our strategy for the first PDSA cycle was the introduction of clinical secretaries to support the work of junior doctors. This was supported by management as part of an already existing programme of interventions to reduce junior doctor workload. This intervention was supported by juniors and both the doctor and secretaries aided the collection of data. The heavy workload of surgical juniors and changes in contracts were drivers in the support of management to introduce secretaries.

Our second PDSA cycle was the introduction of the electronic list. This was introduced slowly, just involving the on-call team. Regular feedback sessions with the surgical teams who use the list were held to encourage buy-in and improve the list. These sessions occurred weekly; we then continued to perform iterative PDSA cycles after each session. New features were highlighted to surgical teams and continued data collection allowed us to demonstrate ongoing improvements.

RESULTS

The average number of minutes the surgical junior spent on the list during their day on call was 121 min and during their night on call, was 91 min. This equates to over 15% (121/720) of the on-call day shift and over 12% (91/720) of the night shift, during which time the junior doctor is also expected to cover seven surgical wards and help clerk new surgical patients. The average number of minutes the colorectal junior spent on the colorectal list prior to PDSA cycle 1 (introduction of clinical secretaries) was 99

min, this equates to over 18% (99/540) of the colorectal day job.

PDSA cycle 1: clinical secretaries

The average number of minutes the colorectal juniors spent on the list prior to PDSA cycle 1 was 99.22 min; following the introduction of clinical secretaries who updated the colorectal list with patient demographics and transcribed blood results this dropped to an average of 43.38 min (online supplementary figure 5). A reduction of 56.28%, representing an average daily time-saving of 55.84 min. However, this intervention did not impact the day on-call, and night on-call times spent on the list.

Subsequent PDSA cycles (2–8)

This involved iterations of the software which was initially an automated version of the Excel spreadsheet.

PDSA cycle 2

The benefit of the first iteration was that patient details and blood results were pulled from a central system rather than requiring human transcription. We then asked junior doctors on the surgical firms to trial this new list and began our data collection which we continued through eight further iterations of the electronic list. These are listed below.

The average number of minutes the surgical junior spent on the day on-call was 121 min, following the introduction of the automated electronic list this dropped to an average of 4.66 min, a reduction of 96.15%. The night on-call dropped from an average of 91 min to an average of 7.38 min, a reduction of 91.89%. For the colorectal list the average number of minutes spent on the list following the introduction of clinical secretaries was 43.38 min, following the implementation of the automated electronic list as part of PDSA cycle 2 this dropped to an average of 17.85 min. A further reduction of 58.85%. This represents an overall reduction from an average of 99.22 min spent on the colorectal list prior to any intervention, to an average of 17.85 min following the eight PDSA cycles, resulting in an overall reduction of 82.01% (online supplementary figure 5).

We noted an immediate and substantial reduction in time spent on the list following implementation of the automated software in the day on-call and night on-call (online supplementary figures 6 and 7). This was not so immediately obvious in the colorectal team list, it would be reasonable to surmise that this observation can be explained by the day on-call and night on-call lists not having been impacted by the implementation of PDSA cycle 1, which had already reduced the average number of minutes spent on the colorectal list by 56.28%.

Contextually the implementation of the first iteration of the automated software occurred shortly after the 4-monthly rotation of the junior doctors onto new job rotations, hence it would not have been unreasonable to expect an initial associated increase in time spent on the list due to the new surgical juniors' unfamiliarity with the surgical list, and potential confounding of the initial data points following the implementation. This however, cannot be clearly identified on the data points gathered.

Feedback was arranged formally through emails and informally when one of our team would go to a surgical ward and talk to the surgical teams about any problems or changes that were highlighted. This feedback would then be brought back to the central team and discussed with the hospital applications developer. If application logistics permitted, the developer would code the change and we would subsequently notify the surgical teams to continue user testing.

The critical organisational factors that made this project successful were the application developer, consultant who supported us by convincing the other surgical teams to trial our software and the junior doctors who agreed to trial our software.

Generalisability: this project is reproducible in the UK and on more of a global scale as it requires data collection capacity, software development and several iterations. It is also applicable to medical patients and wards with both inpatient and emergency admissions. However, it does require support and a willingness to try something new from all doctors on the team.

PDSA cycle 3

- Issues raised were
  - Clavien-Dindo[4] Score request.
  - Liver function tests to be added as well at the normal full blood count, urea and electrolytes and C-reactive protein (CRP).
  - A way to ensure weekend lists comprised all patients from Friday, Saturday and Sunday.
- Outcomes
  - A Clavien-Dindo Score was added with a drop down option.
  - Liver function tests were added.
  - Two date options were added so that a list of patients admitted between those two dates could be created with ease.

PDSA cycle 4

- Issues raised
  - The format of bloods would be more preferable in columns.
  - The patients could not be sorted by patient location.
- Outcomes
  - Bloods in rows were trialled.
  - Patients were made sortable by location.

PDSA cycle 5

- Issues raised
  - On-call days span from 08:00–08:00 rather than midnight to midnight which needed to be reflected in the lists.
  - There was no date of birth generated in this new list, just patient age.

  - Refreshing the system changes the patient location order.
- Outcome
  - The times of on-call days were adjusted.
  - Date of birth was added to the patient identifiers column.
  - The refreshing glitch was adjusted.

PDSA cycle 6

- Issues raised
  - The 'Investigations' box needs to be bigger.
  - Bloods in columns would be preferred.
  - Wards need to be highlighted.
- Outcomes
  - The 'Investigations' box was made bigger with more room for capacity and the 'Plan of Action' box was made smaller.
  - The bloods were put into columns.
  - Wards were made bold.

PDSA cycle 7

- Issues raised
  - Upper gastrointestinal team would like the amylase to be part of the bloods.
  - Urology would like the 'Prostate-specific Antigen' (PSA) to be part of the bloods.
  - Patient body mass index (BMI).
- Outcome
  - Amylase was added.
  - PSA was added.
  - BMI was added.

PDSA cycle 8

Issues raised

- The vascular team wanted the order of bed spaces in their ward to be changed.
- Many of the specialties asked whether there could be a more obvious divider between wards on the list.
- The specialities were also asking for specific base wards to be at the top of their lists when ordered by location.
- Changes to the patient referral system.
- Admission date.

This cycle ended in May 2019 which was at the end of our timeframe.

LESSONS AND LIMITATIONS

The main limitation of this study is that data collection was reliant on accurately recording the time spent on the list each day; although regular reminders were used to encourage the recording of these data, there was no way of objectively ensuring these data were accurate. The initial aim was also to record errors associated with the surgical list; the aim was also to demonstrate an improved safety profile with the electronic system, however we were unable to do this as these data were inconsistently recorded despite attempts to improve this. Transcription errors of bloods would have been reduced to 0% following moving to the electronic system, however we were unable to collect accurate preintervention data.

Patients, admitted for elective surgery and as an emergency, still have to be manually added to a list and therefore there is still the possibility for human error for patients to be left off a list; the aim would be for the list to be fully automated and to remove the possibility for this error. Patients who are due to go home and come back the following day for scans are automatically erased off the software once they leave the building. A separate Excel spreadsheet is created for these patients; this leads to the requirement for two lists and then the possibility of further error. Surgically expected patients referred by their General Practitioner also have to be manually added to this list as they cannot be added onto the system prior to their arrival to hospital.

The key lesson we learnt from this project is the use of feedback sessions to create buy-in from different surgical specialties and then ensuring issues were dealt with swiftly. We gained buy-in from specific consultants by offering to adapt specific features of the list for their specialities. The junior doctor body was behind us as they saw the potential reduction in time spent on the list that we were aiming to achieve. Without these, teams would have struggled to adapt to the lists and may have reverted back to manual spreadsheets. The lack of change and feedback would have lost the initial buy-in we had from across surgical specialities.

CONCLUSION

The aim of the project to reduce the time spent on the list by surgical junior doctors by 50% was exceeded. This reduction in workload has allowed surgical junior doctors to spend more time doing the clinical work they have trained for and has removed the possibility of transcription errors. We have asked the junior doctors using the software to make us aware of any further errors but have not yet been informed of any. Furthermore, user testing conducted within our team has not found any further errors and we believe this to be due to the multiple PDSA cycles we conducted to ensure that the software suited the day-to-day needs of the surgical teams.

The automated software intervention was cost-neutral to the trust, although it also has the potential to save money through less junior doctor hours spent on clerical work. Clinical secretaries are also now able to assist in other areas. Ensuring changes are sustainable is often challenging. Ongoing user engagement, junior doctors education and a new teaching session as part of junior doctor induction have all been part of our sustainability plan. All junior doctors at the hospital have been trained on how to use the software and all new doctors joining the trust will be shown during mandatory shadowing days prior to their first working day at the hospital in addition to the new doctor induction training. We have also created a visual onboarding document that is sent to new junior doctors by email.

Improving the surgical list had been an ongoing challenge which surgical juniors have battled with for numerous years. Although there were many challenges which required careful navigating, these have been explored and resolutions found.

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Acknowledgements We would like to acknowledge the work completed by: Benjamin Pearson, Gemma Clark, Sam Scotcher, Ciaran Doherty, Stephanie Murdock, Aimee Westwood, Anna Uzzell, Felix May, Rachael Menon, Sarah Dean, Vincent Simpson, Emma Sheppard and Jesal Patel.

Contributors HK, EF, AH and JM collected initial data and designed and implemented the quality improvement change. SL mentored HK, EF, AH and JM and implemented the quality improvement change. RB mentored HK, EF, AH, JM and SL and facilitated the quality improvement change. All authors contributed to mauscript preparation

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not required.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement All data relevant to the study are included in the article or uploaded as supplementary information.

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