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Reducing potentially avoidable tasks in a hyperacute stroke unit

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ABSTRACT

The workflow in a stroke unit can be very high, and this is especially noticeable during evening and night shifts, where staffing is reduced but the patient's need for frequent and intensive care is not. The specialised and standardised settings in a stroke regime are constant and demanding for healthcare providers who, therefore, must work efficiently. Patient admissions, acute situations and routine tasks are major contributors to the burden of work during evening and night shifts for junior doctors on call. Thus, it is important to reduce the number of potentially avoidable tasks done by these junior doctors during night shifts so they have more time to perform tasks of high priority. The aim of this project was to reduce the potentially avoidable tasks occurring at night for the on-call junior doctor to only one per shift. We investigated the types of tasks that frequently occur for the on-call junior doctor during the night shift and improved our daily morning and evening rounds to reduce the number of tasks during the night shift. Using the plan–do–study–act method, we made improvements through education, knowledge sharing, checklists and feedback, and we reduced the number of potentially avoidable tasks for on-call junior doctors from a median of 11 to a median of 3 per week, demonstrating that the workload for the on-call junior doctor during the night shift can be reduced through a systematic approach to improving the work routines of doctors and nurses.

PROBLEM

Stroke is one of the leading global causes of death and disability. The incidence of stroke in Denmark is approximately 200 per 100 000.[1] Over the years, there has been a decrease in mortality among patients who had a stroke, but there are still serious consequences. Therefore, it is especially important that a stroke department and hospitalisation for these patients work optimally.[2] Northern Sealand Hospital treats 120 500 patients annually in the emergency department and has approximately 75 000 hospitalisations. The stroke unit has 2400 patients annually, with an average length of stay of 4 days.[3]

It was obvious that the stroke unit of Northern Sealand Hospital was under pressure due to the highly demanding workflow. This was especially noticeable during the evening and night shifts, where there are fewer doctors and nurses on staff to deal with acutely ill patients and new hospitalisations. Furthermore, daytime work sometimes continues into the evening and night. To make more time for dealing with emergencies and issues such as the admittance of new patients, it was important to reduce the number of routine tasks done in the evening and night. A clear plan should be made for the treatment of patients already admitted to the ward who are not acutely ill, and these patients should receive examination results during the daytime, as there is a different distribution of resources for morning rounds. Moreover, the number of patient transitions between doctors from daytime to evening or night must be reduced, as there are added challenges with the transfer of patient responsibility between healthcare professionals during a shift change.[4]

As with any project, the overall aim must be specific, measurable, attainable, realistic and timely (SMART) aim.[5] Here, our aim was to reduce the number of potentially avoidable tasks to only one task per night shift from 23:00 to 08:00 within 17 weeks.

BACKGROUND

There are several quality improvement (QI) projects that focus on optimising flow. Some have a SMART aim to improve the flow in the emergency department,[6] and others relate to the improvement of routines of doctors and nurses in the ward.[7–9]

One QI study from the University Hospital Lewisham described how most patients have at least one routine task that would need completion by the on-call team over the weekend. To prevent this problem from occurring, they created a checklist prior to the weekend. The simplicity of the checklist made it possible for the staff to reduce the number of routine tasks for the weekend.[8] As with our problem, the study showed how routine tasks can continue on the weekend, just as our routine tasks continue during the evening and night.

Over the years, there have been changes in the shifting hours and in the number of

on-call doctors present during shifts in our ward. Even though these types of changes have been helpful, they have not prevented the frequency of non-urgent tasks from occurring at night. Therefore, the focus had to be more than just staffing during the day. It is also important that our changes are based on real facts that show the current issues from our own department. The hypothesis is that increased awareness and focus on the most common tasks for on-call doctors and nurses can help reduce problems. The goal is to improve not only quantity but also quality. Thus, local initiatives are needed to ensure better communication among staff and better patient outcomes.

MEASUREMENTS

Though interest is increasing, QI methodology is still underused in healthcare systems. Improvement methodology involves determining areas needing improvement and making changes in the most effective way. There are multiple tools available for constructing QI projects. We chose to use the plan–do–study–act (PDSA) cycle,[5] which is a systematic, science-based method of learning and QI. The PDSA methodology is used to design and evaluate QIs that involve small-scale changes in a procedure.[10]

We used the PDSA method in an attempt to reduce the workload on the junior doctor on the night shift at the stroke unit of Northern Sealand Hospital. The focus was on taking preventive measures during morning rounds to minimise the risk of problems arising at night and by ensuring the completion of tasks during the day that could cause unnecessary interruptions during the night. We found that there were tasks that should be done in the daytime before the night shift and tasks that should be done the following morning during rounds. We call these two kinds of tasks 'potentially avoidable'. Resolving these problems allows more time for effective treatment of those patients already admitted and gives the on-call junior doctor more time for acutely ill and newly admitted patients.

Our study began by investigating the burden experienced by the doctor on the night shift to determine recurring issues that needed permanent solutions. We designed a call list that the junior doctor on-call was asked to register everything he or she did every night between 23:00 and 08:00. In the morning, the doctor returned the completed list and gave oral feedback on how they thought the night had been and their opinion on what should not have been a task for the night shift (ie, potentially avoidable tasks). The call list was a table wherein the doctor registered the number of interruptions, who or what caused the interruption, what time it occurred, a description of the task causing the interruption and the doctor's action.

Using the call lists, we found that it was possible to generate a run chart of potentially avoidable tasks. It was also possible to create a Pareto chart of the most frequently occurring tasks at night, before and after our interventions. Two checklists were generated from our findings. The checklists were intended as a reminder of the work tasks that could usually be done before the night shift. Our hypothesis was that we could reduce tasks for doctors and nurses on the night shift if the checklists were used properly.

Data collection

Data were collected and observation took place over weeks 35–37 of the year 2020, ending after the night shift of 13 September. During this period, no improvements were implemented. After the final data collection of week 37, we created a Pareto chart from our observations and developed checklists while we continued to collect data using the call lists. The observation period was the baseline measurement.

Our results were dichotomised, as previously mentioned. To achieve uniformity in the assessment of the problems, certain criteria were set.

Appropriate tasks

1. Assignments that need to be done immediately, such as assessments of newly admitted and acute care patients.
2. Basic examination and registration of the death of patients or phone calls from the triage or emergency department, categorised as 'other'.
3. Check-up calls from the nurse to the doctor: this was primarily because the nurse wanted to confirm that the doctor had seen a CT scan of a patient's brain. Even though such a phone call was not necessary, the participating doctors thought it was reasonable to get this check-up call. All the doctors confirmed that they had seen the CT scan of their patient's brain before the check-up call but may not have documented it in the patient file at the time.

Potentially avoidable

1. Care of acutely ill patients admitted in the day shift who lack a detailed plan for the night should a critical situation arise.
2. Administration of prescriptions forgotten during the day or evening shift (eg, medicine for insomnia, delirium, painkillers, intravenous medicine or antihypertensive drugs (labetalol) for patients with intracerebral haemorrhage) or a lack of the discontinuation of a prescription already noted in the patient file.
3. Request from a nurse to change a medicine or medical plan, including tablets, intravenous medicine, reassessment of the frequency of Glasgow Coma Scale scoring and assessment of palliative care.
4. Phone calls from nurses related to issues already described in the patient file.

DESIGN

The analysis of the baseline measures enabled us to identify the actual problems and the number of tasks the junior doctors were performing at night. Thus, we were able to produce the following:

- The driver diagram showing our plans for PDSA cycles and upscale programming, as shown in figure 1. The driver diagram shows how the SMART aim can be

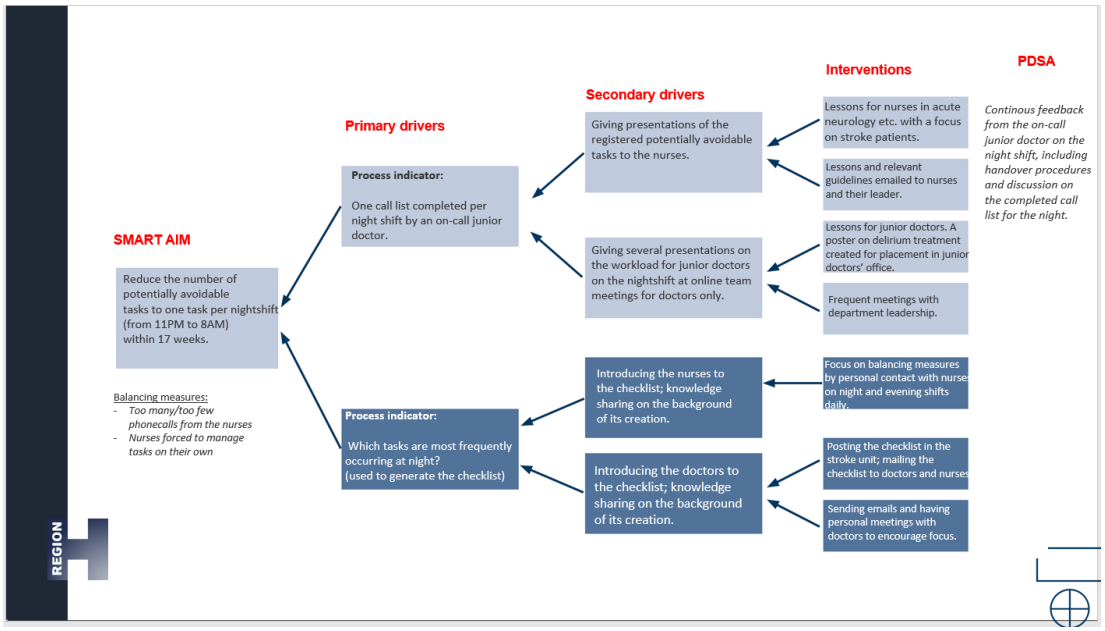

Figure 1 Driver diagram showing our SMART aim, drivers and interventions during the PDSA cycles. PDSA, plan–do–study–act; SMART, specific, measurable, attainable, realistic and timely.

achieved and includes the checklists, teaching lessons for nurses and potential problems highlighted for doctors.

- A checklist based on local facts and intended to reduce the number of potentially avoidable tasks (figure 2A,B).

Our assumption was that a checklist for the nurses and one for the doctors that focused on the most frequently occurring problems would be beneficial to the ward and make doctors and nurses think more about their actions during their daily routine. Thus, our measure of improvement remained to reduce the number of potentially avoidable tasks.

STRATEGY

Our SMART aim was to reduce the number of potentially avoidable tasks to one task per night shift from 23:00 to 08:00, within 17 weeks.

It was important to improve the standards among the staff and to encourage all healthcare providers to think ahead when it came to patient treatment. The doctors

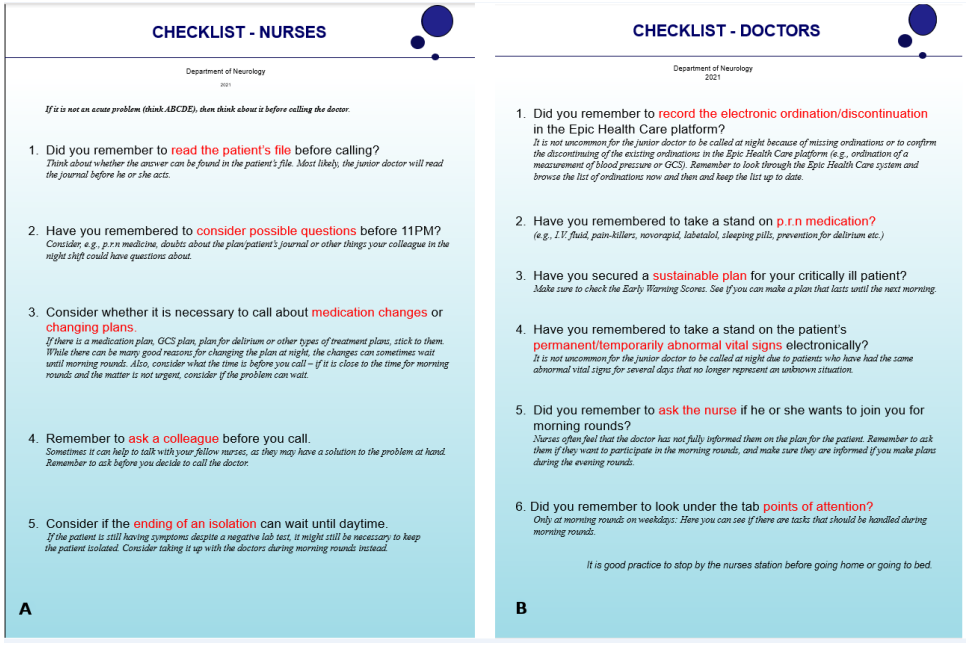

Figure 2 Checklist for nurses (A) and doctors (B) working in the stroke unit.

were encouraged to give the patients a safe and forward plan, thereby preventing waiting time for patients and unwanted situations from occurring at night. It was important to highlight the problems with nurses and doctors by sharing knowledge to improve the daily workflow.

PDSA 1 (weeks 38–39)

From 14 September 2020 to 14 days forward, we tested whether the nurses' checklist was valid enough to make an improvement. As recommended in the methodology of the PDSA cycle, we started using the checklist for small-scale testing first by handing it out to two nurses during their night shifts and discussing the principles of the tasks for the night. We discussed medical issues that may occur at night and how to act on them. This became a form of one-to-one teaching during the nurses' night shift, where there was an opportunity to ask the investigator questions. It was very personal, and there was an opportunity to increase the quality of our workflows and our professionalism. The junior doctors were given the same opportunity in the morning after the end of the shift. This was done daily for 14 night shifts.

Results analysis

To assess whether the effort had an effect, we conducted an ongoing collection and analysis of the results daily during the whole first cycle. The results were analysed by conducting a patient audit of each patient registered on the call list. The medical records of the patients were examined to assess whether there was anything that could have been prevented or done differently. In addition, the performed tasks for the patients at night were analysed thoroughly before the assessment, and oral feedback for the doctor performing the task at night was included in the assessment.

The checklist for nurses was assessed continuously and adjusted as more data were collected. Although our first data used as baseline measurements were very short, they provided a good picture of the most frequently occurring tasks. Small details in the checklist were adjusted successively as the quality improved over time (figure 2A).

PDSA 2 (week 39)

This week, minor medical issues that the junior doctors or the nurses had were in focus. Some young doctors had problems filling out death certificates. Due to COVID-19, minor one-to-one lectures about death certificates were given, and brochures from the National Board of Health were handed out.

Some nurses encountered minor problems that could occur during palliative care. A one-to-one lecture on palliative care was given, and a poster about palliative care was made. A checklist specific to the doctors was created and handed out along with a short one-to-one dialogue about the problems occurring at night.

We continued daily to analyse the call lists filled in by the on-call junior doctors.

PDSA 3 (weeks 40–42)

During these weeks, we focused on the situations that occurred during the night and the nurses' checklist. We had nurses gather in small groups (following COVID-19 guidelines) and gave lessons on the most common problems occurring at night; baseline measurements were also provided. The checklist was shown during these lessons.

A checklist for the doctors was made and emailed to all doctors in the department (figure 2B). A poster on the medical guidelines for delirium was made and posted on the wall in the junior doctor's common office, which was where the junior doctors slept at night. A delirium flowchart was present in the department, but it was not visible to the junior doctors, and most had not used it. The posters complemented each other, and both were made more visible.

We continued to collect the call lists that the junior doctors completed during the night shift to identify more areas in need of improvement.

PDSA 4 (weeks 43–48)

One of the most common tasks that occurred at night was acute medical situations. We decided to give the nurses lessons in acute neurology, with a focus on common issues in the stroke unit. The lessons included information about the Early Warning Score, which is an algorithm in which points are given to an acutely ill patient based on their vital signs: airway, breathing, circulation, disability and exposure principles; hypertensive care of patients with an intracerebral haemorrhage versus ischaemic stroke; atrial flutter; the meaning of high or low pulse or blood pressure and the use of the Glasgow Coma Scale; and stroke in relation to all of the subjects. Due to COVID-19, the same lesson was given several times to allow as many nurses as possible an opportunity to participate. Thus, some nurses attended the lesson more than once. Eventually, the lessons were emailed as a PowerPoint presentation with pictures and simplified descriptions to help the nurses memorise them.

We continued to collect the call lists and analyse the registered tasks.

PDSA 5 (weeks 49–51)

Restrictions due to COVID-19 were the main cause of the lower activity in this period. We tried several times to hold one-to-one lessons on routine tasks for the nurses during the evening shift, but this could not be accomplished systematically because of the staff's lack of time. Therefore, the last PDSA cycle was done by email; we emailed the checklists one last time to nurses and doctors (figure 2A,B).

A lecture was given to the junior doctors on intracerebral haemorrhage. The call list was continued and analysed.

During the entire period, the department leadership was continuously updated on the results and interventions.

Figure 3 Run chart of potentially avoidable tasks from the period of our baseline measurements and during the PDSA cycles. PDSA, plan–do–study–act.

The PDSA cycle with daily improvement measures was carried out from 14 September 2020 to 17 December 2020 (weeks 38–51).

To summarise, we made a daily assessment of the data collected, and then we confirmed, rejected or adjusted the hypothesis accordingly. Information was continuously provided to the healthcare staff to improve quality, and more healthcare providers were continuously included in the process.

RESULTS

The run chart shown in figure 3 displays the number of potentially avoidable tasks that dropped instantly in week 38 when we started our PDSA 1 cycle. We had 5 days of measurements every week. Our SMART aim was one task per night shift. Therefore, the maximum number of acceptable SMART aims per week was five. The median in our observation period before the PDSA started (weeks 35–37) was 11. The median after our improvements was 3, with a declining trend (figure 3). As shown in the run chart for the new median of 3, there were four crossings where we expected to have a minimum of two. The longest run was four, and a maximum of six was expected. Hence, we concluded that the variation was random, and therefore the process was stable. If we included our first 3 weeks in the median and did not split the median into two, it would still be a random variation. This is because of the short observation period: a longer observation period would have gone further to reinforce our statement that the interventions made a difference and reduced the potentially avoidable tasks. We also believe that our PDSA cycles made some difference because of the positive feedback from the junior doctors in the mornings. Unfortunately, our measurements did not show as much sustainability as we wanted to see because we did not have enough time for the whole project.

Contextual elements that might have affected the results are the intake of patients with COVID-19 that started in week 51. This patient group was different from ours, and this might have caused a slight increase in potentially avoidable tasks near the end of the study. However, the number of potentially avoidable tasks remained under the acceptable SMART aim.

In our opinion, this improvement cannot be attributed to one specific PDSA cycle; rather, the repetition of the checklist in every cycle helped nurses and doctors remember to focus on the main problems. Eventually, the lessons in acute neurology for the nurses also had an effect. Repeated and intensive focus on medical issues must be the main drivers of improvement.

The Pareto chart in figure 4 shows the most frequent tasks undertaken during our intervention period. The potentially avoidable tasks were reduced compared with the observation period, as presented in the run chart. Some problems continued to arise at night, such as issues with prescriptions and the reordering of medicine or treatment plans, although not as frequently as before. However, in this new chart, nurses were no longer calling at night to ask about issues already described in the patient file.

Some tasks regarding prescriptions that arose at night were deemed as appropriate because these were related to patients recently admitted to the ward and thus were tasks that the doctor was already aware of and was about to handle. This shows an improvement and, therefore, was marked as appropriate.

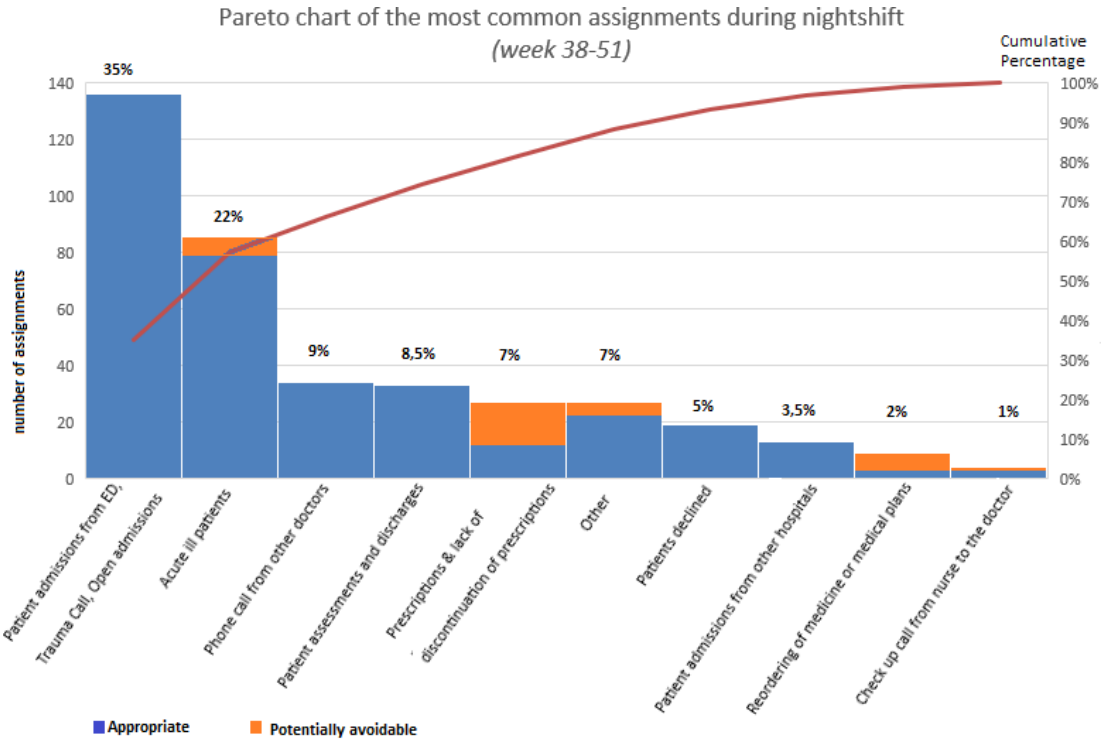

Figure 4 Pareto chart showing the most frequent tasks during the plan–do–study–act cycles from week 38 to week 51, during the night shift of the junior doctor, with 5 days of registration per week. The potentially avoidable tasks are reduced compared with our baseline measurements. ED, emergency department.

LESSONS AND LIMITATIONS

The aim of the project was to reduce the number of potentially avoidable tasks for junior doctors on call on the night shift in our stroke unit. After a period of 17 weeks and five PDSA cycles, we saw improvements in the workflow. The junior doctors expressed noticing changes even after the first cycle.

During the entire project period, an investigator visited the department daily to be updated from the doctors and nurses on the changes due to the intervention. It was important to obtain oral feedback from both groups to ensure progress. The reduction in the number of tasks gave junior doctors more time to attend to patient admissions, the treatment of acutely ill patients and other necessary tasks. Furthermore, reducing unnecessary disruption and sleep disturbance to patients is also of benefit and reduces the risk of delirium, which is common in many departments.

In the first PDSA cycle, the investigator participated in the night shifts where the primary focus was on nurses and discussion of medical issues. After the first cycle, the investigator provided her contact information so that the nurses could ask questions and give feedback at any time. During every PDSA cycle, particularly the last one, the investigator emailed the nurses and doctors several times, reminding the staff that the investigator was available to address any concerns.

A few minor questions arose but were very specific and related to a few doctors who may not have been following the checklist. In addition, the project was not long enough to detect an impact on patient outcomes, but no serious incidents due to the focus areas of the project were registered.

We believe that the frequent emailing and visibility of the investigator during day and evening shifts for the latter cycles gave the nurses confidence in their ability to contact a doctor and provide positive and negative feedbacks, including concerns, if they had any. The nurses were instructed to use their own judgement when determining whether or not a task required a doctor. If they felt it was necessary for a doctor to be involved, they were free to call the doctor at night. This protected against potentially dangerous drawbacks, such as nurses calling less often due to a fear of contacting the junior doctor during the night shift. In addition, in the fourth PDSA cycle, several lessons were given in acute neurology and the use of the Early Warning Score. A score of 3 or more in the Early Warning Score tells the nurse that they should consider contacting a doctor, and a score of 5 points or more tells the nurse that they must contact a doctor. Thus, this algorithm is a safety net for patients and allows nurses to call a doctor for an assessment without hesitation. It was impossible to confirm whether one or more of the nurses had concerns they did share with us, and the Early

Warning Score acted as a balancing measure, as noted in our driver diagram.

COVID-19 made it unfeasible to continue offering lessons to the nurses, and there was also no time to conduct virtual meetings. Thus, the intervention needed to be changed, and in our last PDSA cycle, we focused on one-to-one dialogues and teaching, which were also a problem because of the lack of time available to converse with doctors and nurses in the ward, making it essential that the staff read their emails.

To avoid bias, all results were discussed daily with the junior doctor on the night shift in the department. All tasks related to patients and registered on the call list were assessed by the investigator to see if the task related to the patient was relevant or not. In this way, the junior doctor and investigator agreed on the dichotomisation of the tasks. Patient audits were always performed by the same investigator to eliminate confounding factors, and the previous mentioned criteria for the dichotomisation were always followed.

More time is required to determine the sustainability of the intervention, as a longer observation period would have provided better statistical analysis and thus confirmed our statement of improvement. The run chart contains the minimum amount of data necessary. To prove sustainability, many more measurements are needed. To maintain the trend of improvements after the study ended, the chief of the department continued to discuss the concerns in meetings with the doctors once a week. Furthermore, the checklists are still visible in the department, including in the nurses' office and in the doctors' offices, and these will serve as reminders for the nurses and doctors, as well as educational material for new employees. The run chart has been posted in the conference room and is also intended as a permanent reminder for the staff and for encouraging sustainability.

This project was the first part of our QI programme. After the second part concerning evening and weekend rounds, a group of doctors from the Department of Neurology created permanent guidelines for the types of assignments allocated to doctors on rounds and doctors on call. Thus, we successfully provided a solution to the problem of a heavy workload for doctors on call. These guidelines are presented and handed out to newly hired and current doctors in the department.

Future projects should examine the possibility of streamlining workflow during the night shift. However, we have decided that our next QI project will focus on potentially avoidable tasks occurring during evening and weekend rounds.

CONCLUSION

This project has demonstrated that it is possible to improve routines in the daily work of healthcare providers through the use of a checklist. Focus on the main issues and lessons on neurological problems can improve the quality of healthcare providers' work and reduce the number of potentially avoidable tasks. Our SMART aim was achieved despite difficulties posed by COVID-19. We implemented changes instantly and permanently, and the trend is continuing. To ensure sustainability, more time and measurements before and after the interventions are necessary.

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Competing interests None declared.

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

Patient consent for publication Not required.

Ethics approval All data analysed for the purpose of this study were collected as part of routine quality assurance processes; no patient identifying information was registered. This project was reviewed by the hospital leadership lawyers and was deemed to be a quality improvement initiative and thus exempt from the ethics review requirement.

Provenance and peer review Not commissioned; externally peer reviewed.

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