

POCT in emergency rooms: One key factor for process streamlining with Lean Management

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In the past years, emergency rooms (ER) all over Germany, especially those of maximum-care hospitals, have been faced with an increasing number of patients. This is caused by a variety of factors, including demographic changes, inflexible ambulant services and an overreaching demand for healthcare services.

ER overcrowding causes immensely long waiting times with a negative impact on patient and staff satisfaction and, even more importantly, patient safety [1].

Thus, a process-oriented view with speedy diagnostic work-up, ideally integrated on-site, is indispensable for appropriate patient care. At the same time, medical ethics and economic principles should not correlate negatively with each other.

Among various quality management methods, Lean Management is one option that may help hospitals achieve these goals.

This article describes an ongoing project at the hospital Paul Gerhardt Stift in Lutherstadt Wittenberg and

exemplifies how processes were analyzed, optimized and standardized with Lean Management tools to regain process stability, both as an important indicator of patient safety and process quality and as a driving force for employee satisfaction.

By subsequently eliminating the waste drivers and designing a high-quality patient flow process, and by creating standards supported by state-of-the-art technology, the hospital's Emergency Department (ED) turned into a streamlined department with reduced waiting times, offering employees a satisfactory and modern workplace where patients benefit from first-class care.

Methods

Lean emergency management in the PGS Wittenberg

The Protestant hospital Paul Gerhardt Stift (PGS) in Wittenberg, located between Berlin and Leipzig, has 400 beds and belongs to a private hospital chain of the

Paul Gerhardt Diakonie Group (PGD) with hospitals and special-care homes mainly in Berlin and its surroundings.

Due to its various disciplines, it belongs to the so-called multicare hospitals and additionally has strategic alliances with regional clinics such as a neurologic one. In comparison to 2010, the ED had to cope with an annual increase of 10 %, summing up to about 25,000 patients in 2013.

With the main aims to reduce long waiting times for patients, to increase patient safety and to design a flexible organization structure [2] all over the hospital and already at check-in, the hospital management decided to start the initial Lean project in the ED.

Consequently, a project group consisting of employees of all careers, disciplines and hierarchies working in the ED was established. They received detailed training in Lean methods, such as value stream mapping (VSM), a Lean tool to compare current and future states of processes by focusing on waste drivers, mainly time.

Relevant process owners created the current-state map with the target to show the actual process and to analyze main problems. To illustrate the complexity and

need for speedy diagnostics, the project group agreed on mapping patients with abdominal pain.

Another decisive factor for choosing this patient group is the comparatively high mortality of 5.1 % among these patients [3].

The following six process boxes were mapped (Fig. 1):

- administrative check-in
- primary case history taken by nursing staff
- diagnostics taken by nursing staff
- medical history taken by physician
- interdisciplinary consultation
- check-out

Already at this moment, the first correlations between problems and causes or waste drivers became obvious, since problems were analyzed by the project members in an open-minded, neutral atmosphere without blaming each other.

Then the project group prioritized and clustered the problems, subprocesses were mapped in individual meetings for a detailed analysis of the individual process boxes, and solution approaches were made step by step that were realized in test or pilot phases.

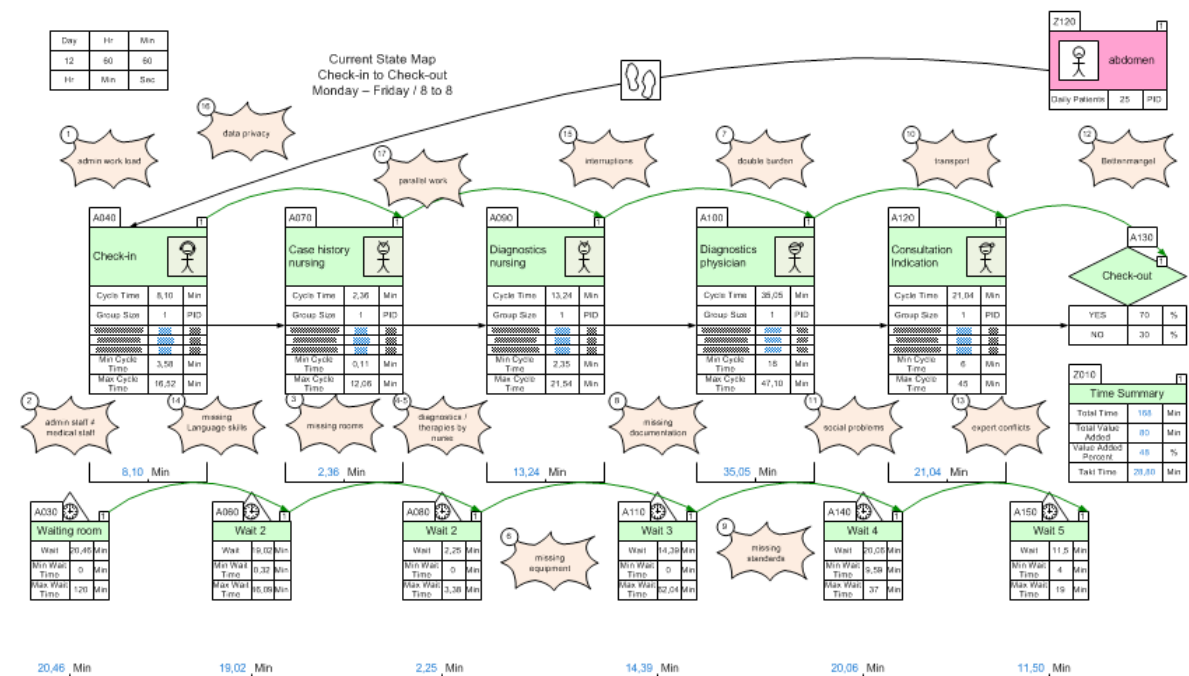


FIG. 1: VSM (current state) created to reflect the clinical process on patients with abdominal pain. Source: Own (project team work)

Time measurements were carried out to complete the current-state map (time level) and to distinguish value-creating activities from waste and non-value-adding activities. After successful testing plus some adjustments and final evaluation of the test results, standards were made.

Results

Out of a variety of problem areas, the main waste drivers to be focused on were:

- bottle-neck already at check-in due to first-in first-out treatment
- not medically skilled staff defines further pathway
- nursing staff decides on diagnosis and even therapies
- double burden for physicians (on-call duty)
- missing availability of laboratory parameters and SOPs

Introduction of a triage system

Complex problems asked for complex solutions. Thus, the Manchester Triage System was introduced. Intuitive nursing experience yielded a structured instrument to assess patients' needs for treatment, considering individual pains and complaints by using a validated system.

Besides quality control (especially risk management) and the option to initiate the treatment process, it is now possible to legally delegate medical activities to the assisting personnel [4].

Introduction of POCT

The problematic transport of blood samples to the laboratory called for a more precise analysis. In fact, measurements showed that it already took 37 minutes to carry blood samples from the ER to the laboratory, whereas the first laboratory results were available after 71 minutes (average).

However, these results were not complete or, rather,

relevant for further decision making. Doctors had to wait at least 30 minutes for the first data and about 90 minutes to initiate further steps.

With the POCT equipment and the combination of laboratory and performance standards, physicians are now so fortunate to receive relevant data after 2 minutes for blood gas analysis (especially electrolytes, hemoglobin and metabolic parameters) and important data from the immunoassay devices after 15-20 minutes.

This means an immense improvement of patient safety and staff satisfaction. These standards have been integrated in the order-entry system of the hospital and serve as general guidelines for the whole organization.

The purchase of the two analyzers was suggested on both medical and process grounds.

Argumentation from a medical point of view

Two main aspects have to be considered: First of all, the increase of medical quality and secondly, the improvement of medical effectiveness for acute patients (rule-out) [5].

The justified arguments follow increased medical-logistic demands in diagnostics and therapy of patients with highly acute or even life-threatening diseases.

Here, one must consider both demands resulting from modern medical expertise as well as SOPs in combination with optimized and efficient patient paths plus proximity conditions and processes that also focus on relatives' requirements.

The blood gas device provides important acute parameters that play a decisive role in emergency medicine, since precise and valid results are available in time and on spot. Loop ways and external influences are omitted.

Argumentation from a process point of view

To increase process stability and quality, the project group made the following future-state map, consisting of six process boxes:

- administrative check-in
- initial assessment by nurse (Manchester Triage) in combination with diagnostics (POCT) according to standards (new SOPs)

- medical diagnostics or waiting area 1 or 2
- medical consultation/indication
- check-out

The new patient path of the ER is illustrated in Fig. 2.

Still, patients check in at the administration area but are then transferred immediately to the triage room. The nurse in charge determines the treatment priority according to the standardized presentation charts,

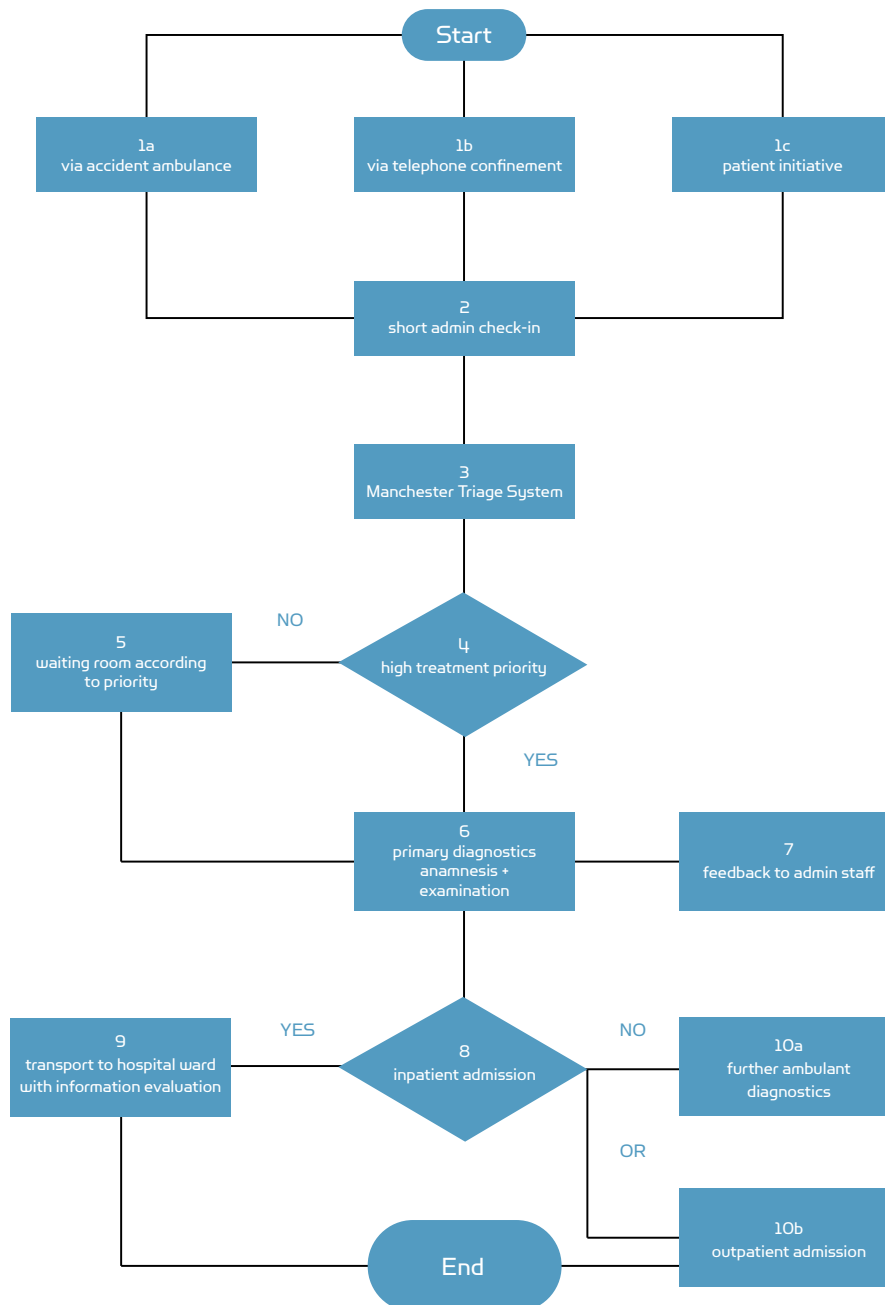


FIG. 2: New patient path with integrated Manchester Triage. Source: Own

examines vital signs and decides on taking laboratory parameters at the POCT equipment according to the laboratory standards.

Laboratory and performance standards

- Profile A – Chest pain/dyspnea
- Profile B – Abdominal pain, incl. gastrointestinal hemorrhage
- Profile C – Pneumonia/sepsis
- Profile D – Apoplexy/neurological deficit
- Profile E – Preoperation
- Profile F – Polytrauma

All profiles include laboratory standards, vital signs and medical orders. Due to that, variances are reduced and errors are minimized, physicians on duty receive credible diagnoses in a shorter time (no symptom-based estimated diagnosis anymore) and postprocesses such as consultations, indications and continuing therapies are accelerated.

Due to the use of POCT devices, opportunity costs caused by waiting times, transport and interruptions of workflow could be decreased or eliminated.

Evaluation

Evaluation of the key data started in the 3rd quarter of 2012 and was performed throughout the year 2013 (December 2013 excluded, since it was not representative).

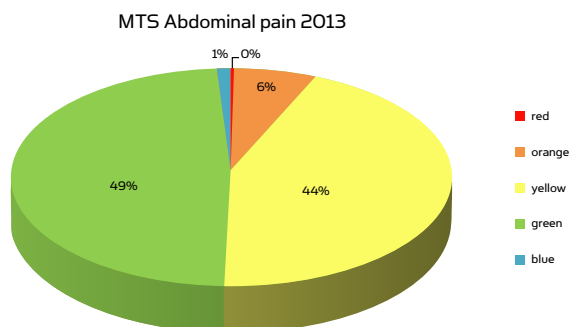


FIG. 3: Graphic charts showing rated patients according to MTS priorities. Source: Own (406 protocols)

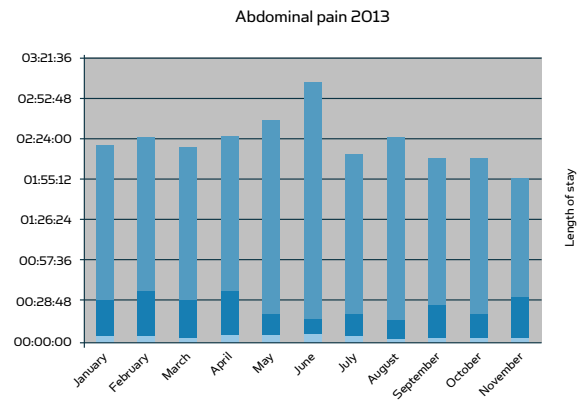


FIG. 4: Graphic chart showing total length of stay of patients. Source: Own (406 protocols)

Following, the results of a total of 406 MTS forms for patients with abdominal pain showing up in the ED in 2013 are displayed in Figs. 3 and 4.

Due to the opening of a Cardiology Department with an integrated Catheter Laboratory in the beginning of 2013, the hospital had additionally to cope with an increasing number of patients with cardiac diseases.

Since especially these acute patients benefit from the triage system, evaluation of 538 MTS forms for this patient group was performed in 2013 also. Results are shown in the following Figs. 5 and 6.

As one can see, the ED is still suffering from crowding effects after physician's consultation due to long waiting times for interdisciplinary consultations and unsatisfactory bed-allocation management.

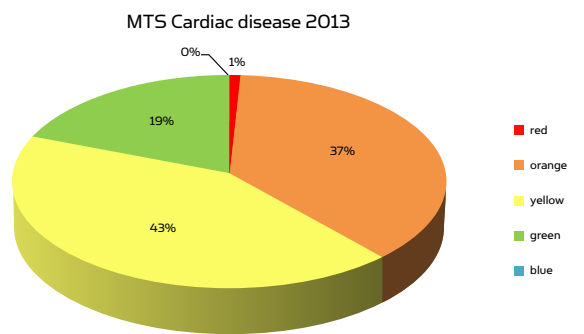


FIG. 5: Graphic chart showing rated patients according to MTS priorities. Source: Own (538 protocols)

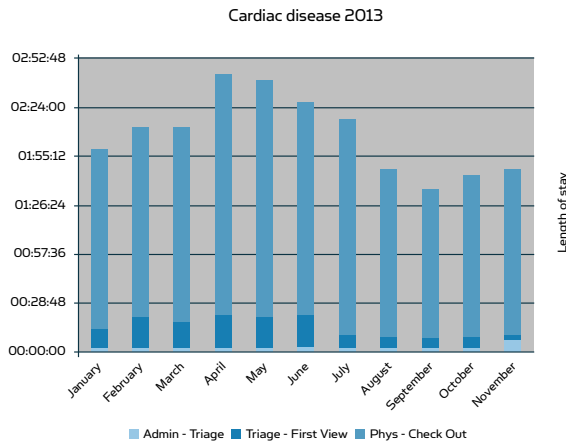


FIG. 6: Graphic chart showing total length of stay of patients. Source: Own (538 protocols)

Therefore, only a slight decline in the average total length of stay could be observed.

Most significant is the analysis of the patient flow within the first four process steps (admission to first view).

Within these process steps, the length of stay for patients with abdominal pain decreased from an average of 60 minutes to less than 21 minutes (3rd quarter of 2013), tantamount to a 65 % decrease of LOS in this period.

Cardiac disease patients' first view is in average less than 9 minutes in the same quarter and can be doubtlessly regarded as excellence in patient safety.

| 2013 | | Abdominal pain | Cardiac disease |
|-------------------------|-----------|----------------|-----------------|
| | Month | min | min |
| | January | 30.33 | 12.39 |
| | February | 37.04 | 19.46 |
| | March | 23.32 | 16.17 |
| 1 st quarter | | 32.23 | 16.01 |
| | April | 35.55 | 21.05 |
| | May | 19.50 | 20.16 |
| | June | 16.37 | 21.03 |
| 2 nd quarter | | 24.26 | 20.75 |
| | July | 19.48 | 9.46 |
| | August | 15.57 | 9.10 |
| | September | 26.55 | 7.16 |
| 3 rd quarter | | 20.53 | 8.57 |

TABLE II: Waiting time of representative patient groups from admission to first view 2013. Source: Own

| Waiting time | 2011 Laboratory | 2013 POCT |
|--------------|-----------------|-----------|
| min | | |
| BGA | 44 | 2 |
| CRP | 82 | 16 |
| Troponin | 81 | 14 |
| D-dimer | 58 | 12 |

TABLE III: Comparison of waiting times for TAT of certain blood samples analyzed in laboratory vs. POCT. Source: Own

Decision making for diagnostic findings and therapy is speeded up due to just-in-time laboratory values.

With POCT equipment, turnaround times for blood tests could be decreased significantly (BGA from 44 to 2 minutes and troponin from 91 to 14 minutes in average).

Discussion

POCT equipment plays a key role in realizing holistic solution concepts for streamlining processes, and modern emergency departments are not imaginable without them anymore.

The combination of:

- a triage system
- strategic operating standards
- symptom-based laboratory standards
- medical equipment
- a staff quality mix

allows:

- the decrease of turnaround times and lengths of stay
- the reduction of process costs (especially opportunity costs)
- intelligent control of patient flow (avoidance of crowding effects)

References

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- increase of patient safety (risk prevention)
- improved employee satisfaction

Due to the initial information about treatment priority given by the triage nurse combined with first vital signs and parameters from the POCT devices according to the standards, one can now consider a reorganization of the previously inflexible processes dominated by the organization into streamlined process working conditions that result in patient safety and employee satisfaction.

Future work will deal with the last two process boxes (consultation and check-out) since the hospital is still struggling with bottle-neck problems at the end of the process chain that negatively influence the total value stream.

Already, the patient transport team service and bed-capacity management have been optimized to relieve the ED, and a Decision Unit for patients that ought to be monitored for decision making (check-out or ward) has been operating successfully.

Conclusion

Lean Management tools provide the opportunity to build more effective and safer clinical processes in the ED.