BMJ Open Quality

Reduction of hospital length of stay through the implementation of SAFER patient flow bundle and Red2Green days tool: a pre–post study

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To cite: Benevides Santos Paiva M, de Gouvêa Viana L, Melo de Andrade MV. Reduction of hospital length of stay through the implementation of SAFER patient flow bundle and Red2Green days tool: a pre–post study. *BMJ Open Quality* 2024;**13**:e002399. doi:10.1136/bmjoq-2023-002399

Received 7 May 2023
Accepted 6 December 2023

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ABSTRACT

Background In 2018, the National Health System released the 'Guide to reducing long hospital stays' to stimulate improvement and decrease length of stay (LOS) in England hospitals. The SAFER patient flow bundle and Red2Green tool were described as strategies to be implemented in inpatient wards to reduce discharge delays.

Objective To verify if implementing the SAFER patient flow bundle and Red2Green days tool is associated with LOS reduction in the internal medicine unit (IMU) wards of a university hospital in Brazil.

Methods In this pre post study, we compared the LOS of patients discharged from the IMU wards in 2019, during the implementation of the SAFER bundle and Red2Green tool, to the LOS of patients discharged in the same period in 2018. The Diagnosis-Related Group Brazil algorithm compared groups according to complexity and resource requirements. In-hospital mortality, readmission rates, the number of hospital acquired conditions and the number and causes of inappropriate hospital days were also evaluated.

Results Two hundred and eight internal medicine patients were discharged in 2018, and 252 were discharged in 2019. The median hospital LOS was significantly lower during the intervention period (14.2 days (IQR, 8–23) vs 19 days (IQR, 12–32); p<0.001). In-hospital mortality, 30-day mortality, readmission in 30 days and the number of hospital acquired conditions were the same between groups. Of the 3350 patient days analysed, 1482 (44.2%) were classified as green and 1868 (55.8%) as red. The lack of senior review was the most frequent cause of a red day (42.4%).

Conclusion The SAFER patient flow bundle and Red2Green days tool implementation were associated with a significant decrease in hospital LOS in a university hospital IMU ward. There is a considerable improvement opportunity for hospital LOS reduction by changing the multidisciplinary team's attitude during patient hospitalisation using these strategies.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Length of stay (LOS) is a leading indicator of health service delivery performance, and better patient flow improves hospital efficiency and safety.
⇒ The 2018 NHS guide to reducing long hospital stays advises using the SAFER patient flow bundle and Red2Green tool to decrease the LOS of adult inpatient units.

WHAT THIS STUDY ADDS

⇒ The implementation of the SAFER patient flow bundle and Red2Green tool in an internal medicine unit ward of a university hospital was associated with significant LOS reduction.
⇒ The ability of the strategies to address the care team's behaviour towards hospitalisation and discharge might be the central aspect responsible for their success.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Our study suggests that the SAFER patient flow bundle and Red2Green tool can safely decrease LOS across different settings.
⇒ The multidisciplinary team's attitude should be considered when implementing strategies for hospital LOS reduction.

INTRODUCTION

As healthcare costs rise worldwide, as well as life expectancy, the increase in hospital efficiency has become a significant concern for healthcare system administrators. Length of stay (LOS) is a leading indicator of health service delivery performance since inappropriate hospital days not only raise expenditure but can also harm patients.[1 2] The reduction of LOS can likewise improve flow in the hospital and bed availability with the prevention of emergency department overcrowding.[1]

Since the 80s, there have been efforts to create a tool to identify unjustified hospital days and their causes. The Appropriateness Evaluation Protocol (AEP) is the most studied technique, with good reliability and validity for acute adult patients, excluding obstetrics and psychiatry.[3 4] Other tools described include de intensity-severity-discharge review

system, the Oxford Bed Study instrument and Medical Patients Assessment Protocol. Despite the limitations of published research, it can be safely concluded that a considerable percentage of hospital days are inappropriate across many different settings.[4]

LOS is the result mainly of patients, healthcare systems and clinical caregivers' characteristics, with the behaviour of the care team regarding treatment and discharge planning playing an important role.[5 6] Using the AEP or other tools, studies demonstrated that unjustified hospital days could be due to delays in medical team arbitration on a treatment plan,[7] delays in specialist consultation,[7–10] conservative attitude of physicians regarding discharge,[11] lack of standardisation in work process among different specialties and absence of discharge planning.[6] Process improvement tools can address most causes of inappropriate days related to clinical staff routine, although changing an established mindset might be a challenge. As an encouragement, a study showed that physicians who worked in different hospitals had lengths of stay similar to each hospital's usual LOS, which indicates an adjustment of practice according to colleagues or local hospital culture.[12] Even if the reason for the pattern variation within the work environment is not clear, the results of the study validate the need for interventions aiming to change care team attitudes in health institutions.

In 2018 the National Health System (NHS) released the 'Guide to reducing long hospital stays' to stimulate improvement and reduce LOS in England hospitals. It gathered strategies to improve patient flow, from emergency admissions to discharge. According to the guide, the more effective actions to reduce LOS should focus on patients' time spent in hospital wards. The main tools described were the SAFER patient flow bundle and the Red2Green days, which should be combined for better results. The SAFER flow bundle consists of five elements: S—senior review before midday; A—all patients must have an expected date of discharge (EDD) and clinical criteria for discharge (CCD) set by the senior; F—flow of patients to inpatient wards starting as soon as possible; E—early discharge; R—review of patients who have been in hospital for more than 6 days. The Red2Green days is a tool to reduce unnecessary waiting by patients. All patients start with a 'red' day, which can be turned to 'green' if the plan for the day is carried out successfully.[1]

The SAFER patient flow bundle and Red2Green days tool's success in reducing LOS can be attributed to its ability to simultaneously tackle different variables that affect patient discharge. The part each factor plays in delaying discharge will vary among institutions according to patient profile, local hospital culture, system's organisation and staff knowledge of its importance to patient flow. Whereas the SAFER patient flow bundle focuses on teams' attitudes and routine, the Red2Green days tool singles out every cause for delay for every patient. By identifying the main constraints in each setting, internal or external to the institution, it is possible to deal with them systemically to prevent the same delays at each admission.[1]

In this study, we aimed to verify if implementing the SAFER flow bundle and the Red2Green days tool is associated with LOS reduction at the internal medicine wards of a university hospital in Brazil.

METHODS

Study design and participants

This pre–post study took place at the internal medicine inpatient unit (IMU) of the university hospital (Hospital das Clínicas) of the Universidade Federal de Minas Gerais (Belo Horizonte, Minas Gerais, Brazil). The outcomes of internal medicine patients discharged from March to May 2018 were compared with those discharged in the same period of 2019 during the implementation of the NHS guide tools. We included in the analysis patients admitted to the IMU ward who were transferred to intensive care and died. The age, sex, Charlson Comorbidity Index and diagnosis-related group (DRG) classification were recorded for every patient to ensure comparability between groups.

The IMU had a 67-bed capacity on two wards in the years the study was conducted. The total hospital bed capacity, including intensive care unit (ICU) and subspecialty beds, was 504 at the time. The university hospital is the area's second-largest public tertiary care facility, with a catchment population of 6 million people. The IMU has eight full university professors working as senior staff, managing seven to nine internal medicine patients' treatment plans each from Monday to Friday. On weekends and holidays, attending physicians work on a shift schedule. The attending physicians set the treatment plan for patients admitted to the ward on weekends, and they are responsible for focused patient re-evaluation and management of organic instability during shifts. Internal medicine residents and medical students are supervised by professors and attending physicians. Seven of the eight internal medicine professors were responsible for rounds both in 2018 and 2019. Some neurology, infectious diseases and cardiology patients, and very few surgical patients, were admitted to the IMU ward in 2018 and 2019. Professors and fellows from other specialties did not participate in the study.

We also analysed 12-month continuous IMU LOS data from July 2018 to June 2019, comparing all patient IMU LOS from before and after the intervention start. A control chart was built to show the results. In July 2019 the IMU lost a 28-bed ward due to the hospital's management decisions. The reduction from 67 to 39 beds affected the IMU patient profile and caused a loss of comparability with the previous months.

The Brazilian public health system, also called SUS, is a healthcare system that is funded by the government and free of charge for everyone. The university hospital is part of this system and provides medical services without any cost. The salaries of hospital professors and attending physicians are paid by the Brazilian Government and are not linked to the volume of inpatient

activity. The system does not involve insurance companies or hospital administrators in patient management. Our research, which was conducted under protocol number 91149018.8.0000.5149, was approved by the University Research Ethics Committee.

Procedures

From mid-February to May 2019, the NHS guide tools SAFER patient flow bundle and Red2Green tool were implemented in the internal medicine wards. In the NHS guide, these two methodologies are recommended to be applied in combination for better results in LOS reduction. All professors, residents, and medical students agreed to participate in the study and signed the consent form.

SAFER patient flow bundle

The main investigator was the IMU manager during the study period. The SAFER flow bundle was implemented through the following actions taken by the ward manager and medical team:

1. Professors were asked to run rounds as soon as possible, always before midday.
2. Professors were asked to set the EDD and CCD by assuming the ideal recovery and no unnecessary waits on the first day of seeing the patient. The resident or medical student recorded the date and criteria on a checklist.
3. The time taken to transfer a patient from the critical care units or emergency department to the ward was monitored. The unit manager and care team discussed the causes of transfer delays. The aim was to admit a new patient as soon as possible at the ward.
4. Professors, residents and medical students were requested to explain daily the treatment plan to patients and families. The preparation for discharge, including paperwork, was prompted to be concluded the day before the EDD. Once the CCD was met, residents were asked to discharge the patient even before the daily round. A discharge lounge was set in the ward so patients could wait for family or friends. The main objective was to raise the percentage of beds empty before noon.
5. Patients with complex clinical or social conditions and higher LOS were discussed separately in a multidisciplinary meeting as needed, organised by the ward manager, to debate treatment plans and discharge strategies.

Red2Green days tool

The day colour was defined according to the NHS Rapid Improvement Guide to: Red and Green Bed Days.[13] All patients started the day as red, and it could only turn into a green day if the professor was present at the round, the EED and CCD were set, and the agreed actions required to progress the patient's journey toward discharge were completed. It was also mandatory for a green day that the patient received care that could only be delivered in an acute hospital bed. If the patient's day remained red, the motive was pointed out. There could be up to two reasons for each red day.

To standardise processes and reduce clinician variations, the participants had to fill in a daily checklist for each patient comprising elements of the SAFER bundle and the Red2Green tool (figure 1).

As recommended in the implementation guides, the IMU executive joined all professor rounds daily, from Monday to Friday, to ensure the teams' methodology understanding and engagement. She collected the checklist, recorded the reasons for the red days and asked questions about the treatment plan, EDD and CCD when the staff did not clearly define them. If the team did not fill in the checklist, the manager would verbally stimulate the determination of EDD, CCD and the day colour. The patients with complex clinical and social conditions were identified, and a multidisciplinary meeting was scheduled. Whenever possible, causes for red days were resolved on the same day with the help of the care team.

A Kanban methodology was used as a visual aid to guide and give feedback to the care team. A whiteboard was placed in every room where the professors discussed the patients' treatment plans with the residents and medical students. The name of each patient, the LOS in the hospital and the LOS in the IMU ward were recorded on the board daily, and little cards were used to signal the day's colour for each patient. All patient days during the intervention period were classified as red or green and recorded by the principal investigator, along with the reasons for the red days.

Diagnosis related group classification

All patients discharged from the IMU wards from March to May 2018 and 2019 were categorised using the diagnosis-related group (DRG) Brazil Platform.[14] The DRG groups patients according to complexity and resource use, allowing outcome comparability among patients in the same DRG. Each DRG has a relative weight, and the DRG case mix is the sum of all patients' DRG relative weights divided by the number of patients. This calculation reflects the severity, clinical complexity and resource needs of all categorised patients. We used the DRG case mix to compare patients from before and during the NHS tools implementation. An experienced nurse entered the information for the DRG classification in DRG coding.

Hospital-acquired conditions

Hospital-acquired conditions (HAC) are clinical conditions or complications that were not present when a patient was admitted but developed because of errors or accidents in the hospital. The DRG coder nurse recorded HACs due to invasive procedures, surgery, medications, transfusions, and care-related, identified in medical records for both patient groups.

SAFER Patient Flow Bundle and Red2Green Days Checklist

Date: _____/ _____/ _____

Patient: _____

Medical student: _____

Internal Medicine resident: _____

Professor: _____

1. Clinical criteria for discharge:
2. Expected date of discharge:
3. If going home today, can the patient be sent to the discharge lounge?
4. Does the patient have complex clinical or social issues? Would the patient benefit from a multidisciplinary meeting to discuss treatment plan and discharge?
5. If I saw this patient in out-patients, would their current 'physiological status' require emergency admission?
6. Could the care or interventions the patient is receiving today be delivered in a non-acute setting?
7. Did the patient received care today that progressed him towards discharge?
8. Is the patient waiting for something? If yes, specify.
    a. Tests
    b. Procedures
    c. Specialty consultation
    d. Transfer to other institution
    e. Family getting ready to receive the patient back home
    f. Other

Figure 1 SAFER patient flow bundle and Red2Green days checklist.

Patient and public involvement

Patients or the public were not involved in the research's design, conduct, reporting or dissemination plans.

Outcomes

The primary outcome was to assess if implementing the SAFER patient bundle and Red2Green tool reduces internal medicine patients' hospital LOS. The secondary outcomes were IMU ward LOS, percentage of patient discharge before noon, in-hospital mortality, readmission rates in 30 days, 30-day mortality and the number of HACs. We also evaluated the care team's adherence in filling out the checklist, the number of red days, and their causes during the intervention.

Statistical analysis

Descriptive statistics were used to examine cohort demographic and clinical characteristics. Frequencies (and relative percentages) were used for categorical variables and median (with IQRs) for continuous variables. The comparative analysis of the categorical variables was made by the χ^2 test. The continuous variables of the preintervention and intervention groups were compared using the Mann-Whitney U or the Kruskal-Wallis test. The 95% CIs were calculated around all point estimates, and $p<0.05$was considered statistically significant. IBM SPSS Statistics V.28.0.0.0 was used in the data analysis. We used the Standards for Quality Improvement Reporting Excellence checklist when writing our report.[15]

Table 1 Patientcharacteristics

Characteristic	2018, n=208	2019, n=252	P value
Age in years - median (IQR)	58 (40–67)	58 (45–69)	0.52
Male - no (%)	100 (48)	131 (52)	0.35
Charlson Comorbidity Index - median (IQR)	4 (2-7)	5 (2-7)	0.40
DRG case mix - median (IQR)	1.06 (0.93–1.57)	1.05 (0.85–1.3)	0.07

DRG, diagnosis-related group.

RESULTS

Two hundred and eight internal medicine patients were discharged from the IMU wards from 1 March to 31 May 2018, and 252 patients were discharged from 1 March to 31 May 2019, an increase of 21%. Both groups were equivalent according to age, sex, Charlson Comorbidity Index and DRG case mix score (table 1).

The patient group discharged after the implementation of the SAFER patient bundle and Red2Green tool had significantly lower median hospital LOS (14.2 days (IQR, 8–23) vs 19 days (IQR, 12–32); p<0.001) and IMU LOS (8.6 days (IQR, 5–24) vs 12.4 days (IQR, 6–24); p<0.001) than the group discharged the year before. The percentage of patient discharge before noon raised from 20.2% to 29.0% (OR=1.23, 95% CI=1.03 to 1.48). In-hospital mortality, readmission in 30 days, 30-day mortality and the number of HACs were the same between groups (table 2). We also observed a reduction in LOS before admission to the IMU wards (3.7 days (IQR, 2–7) vs 5.1 days (IQR, 3–7); p=0.001). Seven multidisciplinary meetings were scheduled to discuss patients with complex clinical or social issues during the intervention period. The checklist completion varied among seniors from 38% to 79% on weekdays (p=0.005).

In the analysis of 12-month continuous data from July 2018 to June 2019, IMU patients' hospital LOS after mid-February 2019 had a significantly lower median compared with the previous period (13.4 days (IQR, 8–21) vs 16.1 days (IQR, 10–28); p<0.001). The control chart is shown in figure 2.

During the intervention period, 3350 patient days were analysed, of which 1482 (44.2%) were categorised as green days and 1868 (55.8%) as red days. The median number of red days per patient was 5 (IQR 2–10). We did not observe a difference in median red days among professors (p=0.071).

Table 3 lists the reasons for red days in the IMU wards. Since up to two causes for each red day could be recorded, there were 2215 reasons documented. The most frequent cause for a red day was the lack of senior review since professors were not present in the ward on weekends and holidays to allow firm decisions to be made. Reasons external to the institution were responsible for only 184 (8.5%) red days.

DISCUSSION

In this longitudinal interventional trial, implementing the SAFER patient flow bundle and Red2Green tool in the IMU wards of a university hospital in Brazil was associated with a reduction in total hospital LOS and ward LOS without any effect on in-hospital mortality, unplanned readmissions, 30-day mortality and HACs. An increase in the percentage of patients leaving the hospital before noon was also observed.

Many inappropriate hospital days result from healthcare professionals' attitudes toward treatment plans and discharge. Studies show unnecessary hospital days because of delays in medical arbitration on a treatment plan,[7] specialist consultation,[7–11] conservative physician attitude,[11] delay in reviewing test results[16] and fragmentation of care.[17] Other factors also mentioned include a lack of standardisation in the work process between specialties, physician's poor communication and absence

Table 2 Primary and secondary outcomes

Variable	2018, n=208	2019, n=252	P value
Hospital LOS - median (IQR)	19.3 (12–33)	14.1 (8–23)	<0.001
Internal medicine unit LOS - median (IQR)	12.4 (6–24)	8.6 (5–24)	<0.001
Pre-internal medicine unit LOS - median (IQR)	5.1 (3–7)	3.7 (2–7)	0.001
Patient discharge before noon - no (%)	42 (20.2)	73 (29)	0.03
In-hospital mortality - no (%)	37 (17.8)	41 (16.3)	0.70
30-day mortality - no (%)	54 (25.7)	51 (20.2)	0.21
Readmission in 30 days - no (%)	51 (24.5)	47 (18.7)	0.14
Hospital-acquired conditions - no (%)	18 (8.7)	12 (4.8)	0.10

LOS, length of stay.

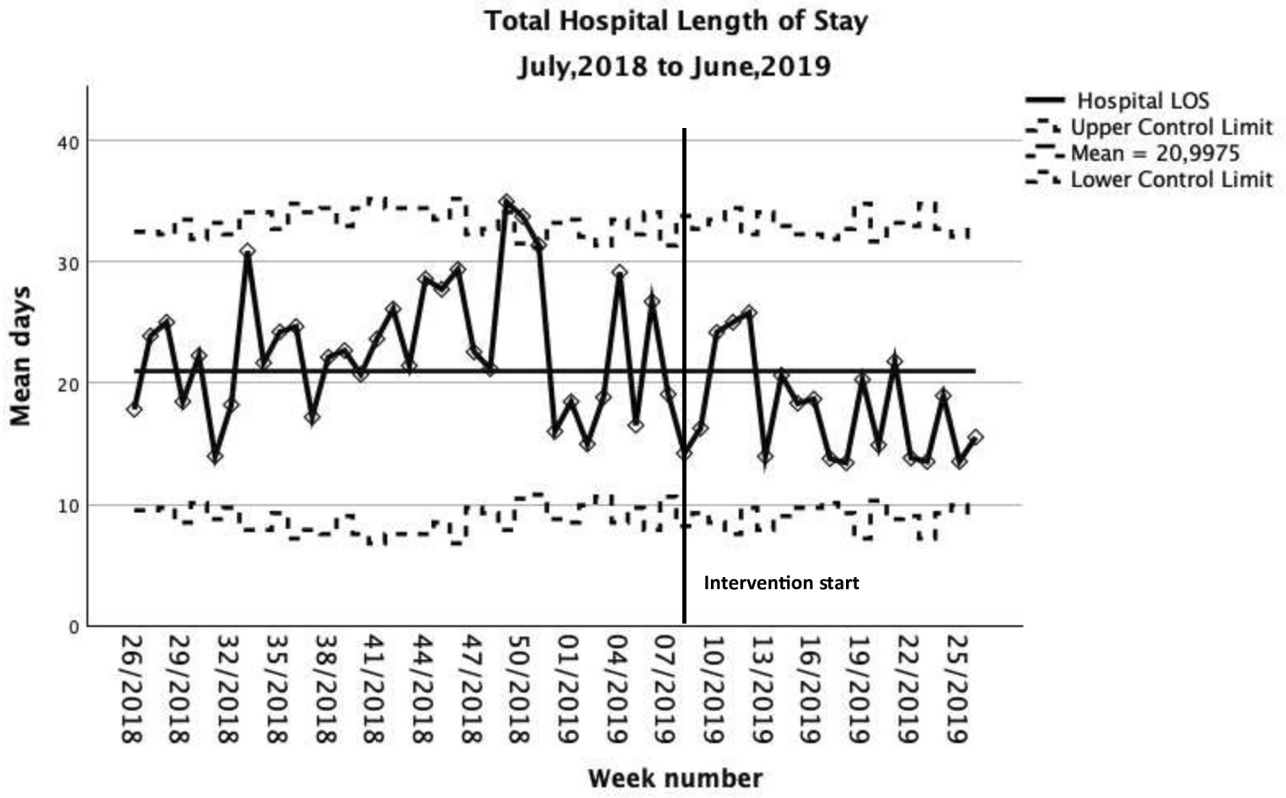

Figure 2 Hospital length of stay (LOS) control chart, from July 2018 to June 2019.

of discharge planning.[6] The SAFER flow bundle and Red2Green tool address the care team behaviour, as it demands the engagement of the multidisciplinary staff and senior physician leadership.[1] The senior presence in board rounds is critical for patient management and objective determination of CCD and EDD. During the implementation of the SAFER patient flow bundle, it was clear the inability of junior residents and medical students to set CCD or EDD on their own. If the CCD or EDD were not filled in the checklist, the main investigator would ask professors to clarify the plan to the junior staff during rounds. A well-informed team organised patient discharge in advance, preventing inappropriate hospital days due to paperwork delays, transportation unavailability, family issues or the lack of 'fit for discharge' status recognition.

The Kanban board placed in discussion rooms contributed to the intervention's positive result. The whiteboard was a focal point where the team could see the 'patient status at a glance', as recommended by the NHS guide[1] The real-time feedback given to the teams made them feel responsible for the red days and delays in discharge. Corroborating with this hypothesis, an Italian study showed a reduction of unnecessary hospital days through a strategy involving direct physician accountability.[18] For paediatric patients, an intervention consisting of weekly feedback and dissemination of summary reports to attending physicians was also associated with a lower risk of inappropriate hospital days.[19]

During the intervention, it was also observed a reduction in pre-IMU LOS. This was probably a consequence of the increased bed availability, attributable to shorter IMU ward LOS. Since the university hospital IMU wards receive mainly patients transferred from ICU and emergency department (ED), that meant a decrease in time to transfer ICU discharge patients and ED patient boarding.[20] The SAFER flow bundle also promotes a better flow of patients to wards, as it advocates in favour of morning discharge and early admission.[1] Applying the bundle raised the percentage of morning discharges in the IMU wards, positively affecting ICU and ED patient flow.

In this study, even during the implementation of the Red2Green days tool and active resolution of constraints, we still had 55.8% of patient days classified as red. Most red days (42.4%) were due to a lack of senior review on weekends and holidays. Since internal medicine seniors are university professors in our hospital, they only visit the wards during weekdays. In the professor's absence, the junior resident would only discuss the patient with the attending physician on shift if he deemed it necessary. That might not have influenced the LOS of patients with a well-established care plan, however, it postponed important clinical decisions (and setting of CCD and EDD) for patients admitted from Friday to Sunday or during holidays. Senior expert consultations were also unavailable on weekends, which was another cause for red days. Resolving this issue requires top management

Table 3 Reasons for red days

Reason	No (%)
Related to multidisciplinary team	**1294 (59.5)**
Lack of senior review	921 (42.4)
Wait for specialty consultation	176 (8.1)
Wait for consultant decision regarding treatment plan	65 (3.0)
Lack of discharge planning	59 (2.7)
Conservative attitude towards discharge	42 (1.9)
Lack of communication between medical teams	31 (1.4)
Related to tests: wait for examinations to be performed or its reports	**575 (26.5)**
Radiology	282 (13.0)
Cardiology	135 (6.2)
Endoscopy and/or colonoscopy	85 (3.9)
Pathology	33 (1.5)
Laboratory	23 (1.1)
External to the institution	**184 (8.5)**
Wait for alternate level of care or patient's family	113 (5.2)
Wait for outpatient dialysis availability	27 (1.2)
Other	25 (1.1)
Related to surgery or invasive procedures	**111 (5.1)**
Miscellaneous	**51 (2.3)**
Total	**2215 (100)**

decisions and complex staff organisation, which was not possible during the study period.

There was also a significant number of red days attributable to the wait for examinations, test reports, invasive procedures or surgery reported in this study (31.6%). It is expected to have some red days because of hospital support services; as for the day to be green, once the test was ordered, it would have to be performed, discussed with the senior, and a clinical decision made on the same day. The high number of red days because of radiology examinations was due to the frequency of the requested tests. During weekdays these examinations were usually performed in 24–48 hours, but non-urgent tests and procedures were not scheduled on weekends or holidays. This limitation also increased the number of inappropriate hospital days. Since they were already somewhat efficient, the investigators and unit manager had limited action on red days caused by support services alone. What usually demanded mediation by the unit manager was deliberation on the treatment plan or the need for invasive procedures by the surgical teams together with the internal medicine senior. These unjustified days, however, were classified as related to the multidisciplinary team rather than to support services.

The checklist was an important aid for teams to remember the elements of both methodologies during rounds. Two teams had a delay to begin filling out the checklist, due to senior initial reluctance. The internal medicine professors' main concern was the loss of decision autonomy. The attendance of rounds by the IMU manager had a crucial role in reassuring that the treatment plan, as well as the CCD and EDD, were the senior's responsibility. It was also critical to impute a sense of partnership between clinicians and manager, with a focus on patients' welfare. When the checklist was not filled by the team, the unit manager would verbally ask about the strategies' main elements during visits, set the day colour for each patient and fill out the whiteboard.

As perceived by the investigators, the interventions' sustainability depends on the continuous engagement of the care team, along with the indispensable presence of a manager or a dedicated medical leader, and constant feedback. The hospital manager or medical leader guides and oversees the operation, fostering a culture of accountability. With his or her leadership, they provide the necessary support, resources and motivation to keep the intervention on course for the long term, ultimately resulting in sustainable improvements in patient care and healthcare quality. Another study using the SAFER flow bundle and Red2Green days tool in the surgery department demonstrated the need for persistent senior staff commitment to sustainability.[21] As also shown by Caminiti *et al* constant feedback of results to the care team plays a pivotal role in enhancing intervention engagement. It creates a dynamic feedback loop, leading to a sense of ownership and responsibility for the intervention's outcomes.[18]

To our knowledge, there are only two other studies describing the use of the SAFER patient flow bundle and the Red2Green tool published in scientific literature. Valente *et al* used a structured daily multidisciplinary board round framework adapted from both strategies to enhance patient flow. There was a significant reduction in general/digestive surgery patients' LOS by 12.5%.[21] Another study described the implementation of both methodologies in a neurosurgery department. Although the investigators confirmed the successful implementation of the strategies, they did not report LOS reduction or other flow improvement metrics. The most common reason for a red day was the wait to transfer a patient to a bed under the care of another team.[22]

Other frequent strategies described to reduce hospital LOS are clinical pathways and discharge planning. Clinical pathways intend to increase efficiency during hospital stays by detailing the steps necessary to treat a specific clinical problem.[23] One systematic review showed a decrease in LOS and mortality of patients with heart failure with the implementation of care pathways.[24] Another systematic review, more comprehensive, could not conclude on LOS due to the heterogeneity of studies included in the analysis.[25] Differently from the SAFER patient flow bundle or Red2Green days, clinical pathways are specific to a disease or syndrome, and even so, they usually fit only the usual patient. Through process standardisation,

it can tackle some care team behaviour issues, but it does not deal with hospitals' infrastructure or patient flow problems.

There's good evidence that discharge planning improves patient quality of care. Still, two systematic reviews found only a modest decrease in LOS,[26 27] one was inconclusive[28] and another had a negative result regarding LOS.[29] In the SAFER patient flow bundle, once the CCD and EDD are set, the multidisciplinary team must ensure the patient is ready to go home on the specified date. That includes, almost naturally, the discharge planning inside the bundle. Patients with more complex clinical or social conditions and extended hospitalisations are reviewed weekly, and arrangements are made to discharge the patient safely as soon as possible.

Strengths and limitations of this study

To the best of our knowledge, this is the first published study showing a significant reduction in hospital LOS of internal medicine patients associated with the implementation of the SAFER patient flow bundle and Red2Green days tool. Despite the recommendations described in the NHS Guide to reducing long hospital stays since 2018, the available literature is scarce.

This study has some limitations. The strategies to reduce LOS were implemented only in internal medicine wards of a Brazilian tertiary care hospital. Further research will be needed to validate the SAFER patient flow bundle and Red2Green days tool in other settings. The main investigator did the categorisation of red and green days alone, and the reliability and validity of the Red2Green classification have not been established. Lastly, high in-hospital mortality and readmission rates were observed in 2018 and 2019. This was mainly due to the institution's patient profile, which includes a high percentage of palliative care inpatients and a lack of hospices in the Brazilian healthcare system. All patients who died in the ward during the study were in palliative care, and all other patients were transferred to ICUs on organic instability.

CONCLUSIONS

In this longitudinal interventional trial, the SAFER patient flow bundle and Red2Green days tool implementation were associated with a significant decrease in hospital LOS in Brazil's tertiary care IMU ward. The SAFER bundle and the Red2Green days tool shift multidisciplinary teams' priorities toward discharging the patient home. Senior clinicians, junior staff and medical students realised the consequences of deferring decisions and treatment planning or keeping the patient hospitalised without a clear reason. Signalling red days on whiteboards due to care team delays turns visible the uncomfortable truth that the unjustified hospital days are not only a hospital managers' issue. It is usual to blame extended hospital stays only on flaws in internal or external structure, such as the availability of in-hospital support services or transfers to alternate levels of care. They can play a significant part in some settings, but understanding the importance of the care teams' behaviour is crucial. Due to our work limitations, more studies are needed applying the SAFER patient flow bundle and the Red2Green days tool in other settings to confirm their efficacy in decreasing LOS. It should be realised by managers, however, that a significant improvement opportunity for hospital LOS reduction is changing the multidisciplinary team's attitude during patient hospitalisation, decreasing inappropriate days, and promoting more efficient care.

Acknowledgements We would like to thank all internal medicine professors, residents and students who agreed to participate in the research. We also thank the internal medicine unit dedicated administrative staff who provided invaluable support and assistance during the course of this research, specially Juliana Alves Rosa.

Contributors MBSP: Conceptualisation, data collection, data analysis and manuscript writing. LdGV: Conceptualisation, manuscript writing and supervision. MVMdA: Conceptualisation, manuscript writing, supervision and guarantor.

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 applicable.

Ethics approval This study involves human participants and was approved by Universidade Federal de Minas Gerais Research Ethics Committee approved the research design under protocol number 91149018.8.0000.5149. Participants gave informed consent to participate in the study before taking part.

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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