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RESEARCH ARTICLE

Pilot Study on SAFE Score - A Novel Quantitative Metric for Evaluation of Patient Well-being in Crawfurd Hospital Transitional Care Facility (CFH TCF)

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Abstract

Crawfurd Hospital (CFH) set up a Transitional Care Facility (TCF) in November 2022 as an interim holding facility for medically stable patients awaiting a long-term discharge disposition. The team invented the SAFE score, to monitor 4 main domains commonly impacted in long-term stays – namely Skin, Action (Behaviour), Function and Emotion. A sample size of 50 patients met the inclusion criteria and were scored by the nurses on day 7, day 14, and monthly thereafter during their TCF stay, and once more within 72 h prior to their discharge. There was no significant improvement or worsening noted across all 4 domains in this pilot study, suggesting that the TCF has achieved its goal of maintaining its patients in all these domains. The scores at the various time points were also useful for the team to immediately identify changes in individual patient scores and act on these findings to ensure optimal patient care. Through this pilot study, we identified further minor improvements which can be made to the and the score, and such a scoring system may further be applicable to various intermediate to long-term care homes to oversee these domains of care.

Keywords: Transitional care, Long-term, Scoring, Metric, Patient well-being

1. Background

As Singapore gradually returned to normalcy post-COVID-19 pandemic, there was an influx of non-COVID-19 patients presenting to acute public hospitals, comprising those who may have turned unwell or missed medical follow-up due to the strain on the healthcare sector in the preceding years of the pandemic.[1] This was further exacerbated by Singapore's rapidly ageing population, with 1 in 6 Singaporeans currently aged 65 and above.[2] The bed occupancy rates across acute public hospitals averaged 88–93 % in the month of October 2022 alone,[3] with waiting time in the emergency department for an inpatient bed surging up to 50 h.[4] In an effort to alleviate the severe bed crunch in public hospitals, the Singapore government set up Transitional Care Facilities (TCFs) to decant medically stable patients who are fit for discharge to the community, but remained warded in public hospitals due to outstanding social issues hindering discharge.[5] The large proportion of TCF patients are transferred over to await placements in institutions such as nursing homes, or while awaiting arrival of a caregiver such as a foreign domestic worker. While in TCF, patients can be managed for simple medical events, but are sent back to the acute hospitals if the level of medical care, investigations or treatment cannot be supported by the TCF. Crawfurd Hospital TCF (CFH TCF) opened its doors on November 1, 2022 with a 43-bed capacity.

2. Introduction

As a facility housing patients who are medically stable, and in line with the hospital's biopsychosocial model in patient care, the goal of the team in CFH

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TCF includes provision of maintenance care in the following 4 domains: (1) nursing (2) medical (3) functional status and (4) psychological well-being.

In order to evaluate the ability of the facility to achieve this goal, the CFH TCF medical team sourced for a concise yet targeted scoring system which would adequately cover these 4 aspects and promptly provide feedback to the medical team on the progress of its patients in these areas. The team explored existing scoring systems such as the following:

1. Resident Assessment Form (RAF)[6]

The RAF is used by the Agency for Integrated Care (AIC) to assess the level of care needed by a patient for the purposes of determining a suitable discharge disposition. The assessor assigns a score for the patient's needs in the domains of mobility, feeding, toileting, personal grooming, treatment required, level of emotional needs, frequency of confusion, psychiatric problems and behavioural problems. This score is then totalled up and patients are classified into Category 1 (less than or equal to 6 points), Category 2 (7–24 points), Category 3 (25–48 points) or Category 4 (more than 48 points). These categories are then used to determine the patient's eligibility for various discharge dispositions (e.g. patient needs to be Category 3 or 4 to qualify for nursing home). Refer to **Annex A** (https://scholarlycommon.gbmc.org/cgi/editor.cgi?article=1285&window=additional_files&context=jchimp) for the detailed RAF Form.

While the RAF comes close in giving an indication of a patient's physical function (through questions about mobility, feeding, toileting, grooming), level of medical care (through questions such as treatment required, frequency of confusion/behavioural problems), and aspects on psychosocial well-being (level of emotional needs, frequency of psychiatric problems), it provides limited feedback on the level of nursing care rendered. In addition, by totalling up the score, one would be unable to assess performance within each domain to immediately identify targeted areas for intervention.

2. Functional Independence Measure (FIM)[7]

The FIM was designed to assess the functional status of patients with mobility impairments and therefore places heavy emphasis on patient's function, with lesser emphasis on nursing/medical needs, as well as psychosocial well-being (see Fig. 1).

3. Sickness Impact Profile (SIP)[8]

The SIP is a questionnaire designed to holistically assess a patient's health status, covering 12 categories across biopsychosocial domains. However, it consists 136 questions requiring 20–30 min for administration, which would hence be impractical for regular use in the TCF.

MOTOR COMPONENT		COGNITIVE COMPONENT	
Self care:		Comprehension	
Eating	___	auditory/visual	___
Grooming	___	Expression	
Bathing	___	verbal/non-verbal	___
Dressing upper body	___	Social cognition	
Dressing lower body	___	Social interaction	___
Toiletting	___	Problem solving	___
Sphincter control:		Memory	___
Bladder management	___		
Bowel management	___	COGNITIVE SUBSCORE	
Transfers:			___/35
Bed/chair/wheelchair	___		
Toilet	___		
Bath/shower	___		
Locomotion:			
Walking/wheelchair	___		
Stairs	___		
MOTOR SUBSCORE		TOTAL FIM SCORE	
	___/91		___/126

Fig. 1. Functional independence measure.

As such, the CFH TCF medical team invented the SAFE score, identifying the 4 components of Skin, Action (Behaviour), Function and Emotion – areas commonly observed to be negatively impacted in long-term stays. The scores were designed to be trended at regular intervals throughout the patients' stays as an assessment of the 4 domains of nursing, medical, functional status and psychological well-being which the TCF aims to maintain for its patients.

The "Skin" score evaluates the number of pressure and non-pressure related wounds and evaluates the extent of the wounds (if any). As an organ frequently vulnerable to pressure and injury (e.g. skin excoriations) particularly in long inpatient stays, which is further impacted by medical factors such as nutritional status, we felt that monitoring the condition of the patient's skin would provide an indication on the care rendered in the medical and nursing domains.

The "Action" score assesses the frequency of disruptive behaviours (e.g. shouting, violence) and non-disruptive behaviours (e.g. medication refusal, climbing out of bed). This mainly provides an assessment into the psychological well-being of the patient, and well as the medical and nursing team's capabilities in providing non-pharmacological and

pharmacological measures in targeting behavioural issues.

The "Function" score looks at the level of assistance required in managing the patients' Activities of Daily Living (ADLs), specifically dressing, eating, ambulation, toileting and showering. This provides assessment of a patient's functional status to promptly identify and perform targeted interventions if functional decline is noted during their TCF stay.

The "Emotion" score was crafted as an assessment of the patient's overall psychological well-being measured by their overall mood and appetite observed.

Within each component, the scoring matrix was designed for longitudinal comparison within each category (and not across categories), with expectation to maintain the same score across all domains throughout the patient's stay. A rise in score would suggest an area for improvement and vice versa. Refer to **Annex B** (https://scholarlycommon.gbmc.org/cgi/editor.cgi?article=1285&window=additional_files&context=jchimp) for the detailed SAFE Scoring Form.

3. Methodology

In this pilot study, patients were scored by the staff-nurse-in-charge of the patient in all 4 domains of S-A-F-E on Day 7 of admission, Day 14, monthly thereafter and within 72 h prior to discharge from the facility. We chose Day 7 as the date of the first scoring to ensure that the nurses had sufficient time to obtain a clear idea of the patient's baseline needs, behaviour, function and emotion, rather than scoring earlier in the admission with limited knowledge of the patient.

These scores were longitudinally compared within respective categories to evaluate for improvement or deterioration in specific domains.

We included all patients who were admitted on or after December 15, 2022 and were discharged on or before April 13, 2023. Among these patients, those who turned unwell and were sent back to acute hospitals for treatment were excluded. Patients who stayed for less than 14 days were also excluded as at least 2 scores with adequate interval between each score were required for comparison. This provided a total of 50 patients included in our pilot study.

4. Results

4.1. Patient demographics

Among the 50 patients in our pilot study, the demographics are shown in Table 1.

Table 1. Demographics table.

Demographic	Number	Percentage (%)
Gender		
Male	28	56
Female	22	44
Age (Years)		
More than or equal 90	4	8
80−89	16	32
70−79	14	28
60−69	11	22
50−59	4	8
<50	1	2
Median Age	75.5	N/A
Mean Age	74.6	N/A
RAF Category at the Point of TCF Transfer (As scored by transferring institution)		
Category 1	1	2
Category 2	10	20
Category 3	29	58
Category 4	10	20

In line with the purpose of a TCF to largely manage patients with care needs awaiting dispositions such as a foreign domestic worker or nursing home placement, the majority of the patients are scored in Category 3 and above based on the RAF. 68 % of patients are above the age of 70, with mean age of 74.6 years old.

4.2. Analysis of scores

Table 2 reflects the maximum and minimum scores of the patients across the time points of admission, Day 14 and discharge.

Noticeably, the minimum and maximum score across all categories range widely, with the minimum score at 0 across all categories, ranging up to the maximum score of 13 in the function domain. This is expected given the wide case mix seen in our TCF.

As seen in Table 1, we receive a proportion of patients who may be young and/or fall into RAF Category 1 or 2, suggesting low care needs. These patients may be completely well physically and cognitively,

Table 2. Maximum and minimum scores.

		Day 7 (Admission)	Day 14	Discharge
Skin	Min	0	0	0
	Max	8	8	7
Action	Min	0	0	0
	Max	6	6	5
Function	Min	0	0	0
	Max	13	13	13
Emotion	Min	0	0	0
	Max	7	6	5

but are unable to return home due to social circumstances. As such, they await discharge dispositions such as shelter homes or senior group homes, where they are required to manage independently, contributing to the low minimum scores seen in areas such as skin, action and function.

On the other hand, patients with high care needs (e.g. bedbound, uncommunicative, tube-fed) contribute to the high function scores, of which a score of 13 corresponds to an individual who is fully dependent in his/her ADLs. Being at high risk of multiple and high-grade pressure injuries which can be managed in the TCF, these patients also largely account for high "Skin" scores as seen.

We further performed a statistical analysis comparing the median and mean score of each domain between (1) Day 7 and Day 14 (2) Day 7 and Discharge (see Table 3, Figs. 2 and 3). We only compared these data sets as most patients had been discharged by the time the next scoring (i.e. 1 month after D14) was due, resulting in a limited sample size of subsequent data sets for analysis.

This demonstrates that there was no significant worsening or improvement noted across all 4 domains between comparison time points, suggesting that CFH TCF has met its goal in maintaining her patients across all 4 domains.

5. Discussion

On top of using statistical analysis as an audit tool to identify any significant improvement or worsening of care across the board in all 4 domains, the SAFE score is also used on a day-to-day basis to immediately identify changes in score for **individual** patients from one time point to another. We have illustrated some examples in Table 4.

Over the course of data collection and reconciliation of reasons behind acute changes in scores, we identified possible confounders which could potentially lead to a degree of deviation in SAFE scoring. Some of these include:

5.1. Locum nature of staff

As CFH TCF runs mainly on a locum pool of nurses, different nurses might be taking care of patients on different days. As such, this creates room for error in scoring depending on the familiarity of the nurse with specific patients (e.g. when scoring is due on D7, the nurse in charge might be seeing the patient for the first time). In addition, different nurses may have varying ways of managing patient's needs which might affect the score as well. For example, in a patient who is ambulant but requires significant assistance to go to the toilet, some nurses might assist the patient in ambulation to the toilet, while others may choose to use a commode to push patient to toilet, leading to discrepancies in "Function" scoring.

To mitigate this issue, if in doubt, the staff-nurse-in-charge would consult other nurses or the TCF team lead physicians who are more familiar with the patient to ensure scoring is accurately performed. Additionally, when a score increase or decrease is noted, it is immediately verified with staff familiar with the patient (or the patient or family member) to confirm the validity of this change. Should this score be used in longer term facilities such as nursing homes with permanent staff and where patients stay for longer durations, these discrepancies can be mitigated with a more regular full-time (non-locum) workforce to care for a stable pool of patients familiar to them. Standardised protocols can also be set by the institution to ensure consistency across

Table 3. Statistical analysis for comparison across time points.

	Comparison Between Day 7 (Admission) and Day 14			Comparison Between Day 7 (Admission) and Discharge		
	Median Score at D7	Median Score at D14	Significance level (two-tailed) with Mann-Whitney *U* Test[9]	Median Score at D7	Median Score at Discharge	Significance level (two-tailed) with Mann-Whitney *U* Test
S	0	0	$p = 0.74$	0	0	$p = 0.70$
A	0	0	$p = 0.91$	0	0	$p = 0.87$
F	6	6	$p = 0.91$	6	6	$p = 0.87$
E	1	1	$p = 0.79$	1	1	$p = 0.65$
	Mean Score at D7	**Mean Score at D14**	**Significance level (two-tailed) with Student's T Test[10]**	**Mean Score at D7**	**Mean Score at Discharge**	**Significance level (two-tailed) with Student's T Test**
S	0.3	0.4	$p = 0.75$	0.3	0.4	$p = 0.29$
A	0.6	0.6	$p = 1.00$	0.6	0.6	$p = 0.94$
F	6.6	6.6	$p = 1.00$	6.6	6.5	$p = 0.75$
E	1.3	1.2	$p = 0.77$	1.3	1.2	$p = 0.70$

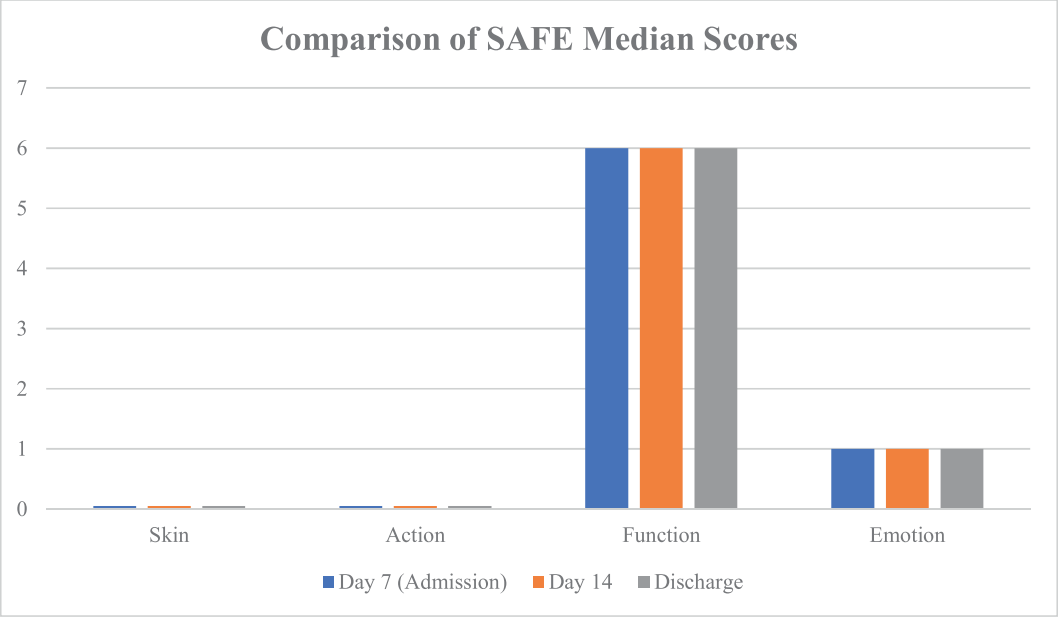

Fig. 2. Comparison of SAFE median scores.

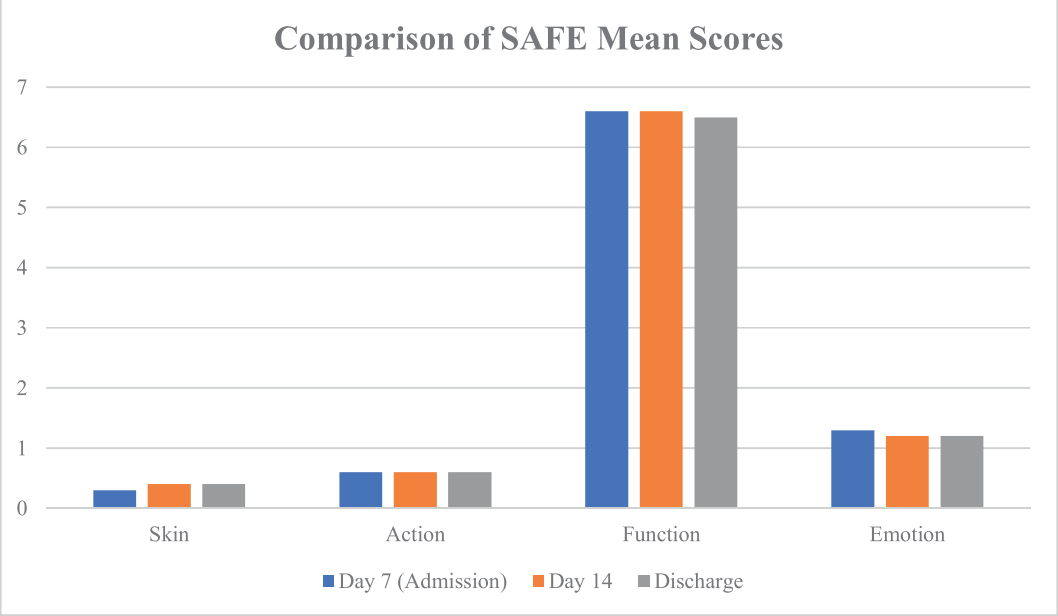

Fig. 3. Comparison of SAFE mean scores.

nurses in the standards of care depending on a patient's mobility status.

5.2. Degree of subjectivity in scoring

Although the SAFE score was designed to be as objective as possible, there are some components which are inevitably subjective such patients' moods, which could vary on a day-to-day or week-to-week basis, and further confounded by factors such as personal comfort level or familiarity with the staff-nurse-in-charge, and consequently affecting "Emotion" score. This can be mitigated by ensuring scoring is done by a full-time staff familiar with the patient's baseline mood/emotions to input a score based on the patient's general baseline as observed across a 1-week interval.

In addition, for "Skin" scoring, different nurses might classify "wounds" differently. While one nurse may consider a dry scab as a wound, another

Table 4. Scenario examples of how SAFE score is used on daily basis.

Scenario Example	Practical Intervention by Multi-disciplinary Team (MDT)
Increase in "S" (Skin) Score	1. Comparison of current condition and previous wound photos to verify that increase in score is indeed related to increase in number or worsening of condition of wounds. 2. Once verified, issue is flagged up to doctors and nurse manager and reported as adverse event if indicated. 3. Nurses and doctors will work together to identify underlying cause and formulate plan to improve condition (e.g. nutritional intervention, use of air mattress).
Increase in "A" (Action) Score	1. Verify with healthcare provider/family member familiar with the patient that there has indeed been worsening of behaviour. 2. Nurses and doctors (in collaboration with family where appropriate) will identify cause such as potential delirium, any unmet needs and non-pharmacological interventions as needed. 3. Doctors to prescribe pharmacological interventions as appropriate. 4. Monitor score for improvement or maintenance at next scoring time point.
Increase in "F" (Function) Score	1. Verify with a regular healthcare provider/patient that there has indeed been decline in function which is unrelated to the healthcare provider's preferences or methods in caring for a patient. 2. Nurses, doctors and therapists will collaborate to identify underlying cause such as medical illness, nutrition, lack of participation in therapy sessions and formulate plan for intervention (e.g. increase in therapy frequency).
Increase in "E" (Emotion) Score	1. Verify with regular healthcare provider/patient/family that there has been worsening of mood and/or appetite. 2. Work with MDT and patient care officer to engage patient in activities and non-pharmacological measures to raise mood (e.g. singing, drawing, games), modify diet to suit patient's preferences where can be accommodated.

might not, leading to possible discrepancies. Moving forward, in future versions of the SAFE score, the definition of a "wound" should be standardised to ensure uniformity in scoring.

5.3. Medical illness

CFH TCF is able to manage medical issues in patients with acute medical conditions such as urinary tract infections, pneumonia etc, as long as their medical needs can be met in the TCF. Patients for whom scoring was done during periods of illness would naturally reflect poorer scores possibly due to accompanying symptoms of lethargy/lower mood associated with illness. In a future version, an additional field can possibly be added to the scoring to indicate if patient is having an acute illness at the point of scoring, so that the data can be interpreted with this in mind.

6. Future recommendations and application

6.1. Comparison against pre-morbid status

In future iterations of the SAFE score, particularly in the setting of a hospital or TCF, it would be useful to obtain the baseline score of the patient prior to their initial hospitalisation from the patient or their family members. This would contribute an important additional timepoint for comparison, and mainly serve to provide a SAFE score target for which the patient should work towards, as it is important for patients to return to their pre-hospital baseline (within realistic limits of any potentially new medical conditions) in all four domains. This would make the SAFE score further applicable and useful in the setting of acute hospitals and step-down rehabilitation facilities, where the goal of care is improvement, beyond just maintenance.

6.2. Reducing variability in the SAFE score

We also recommend that the SAFE score should be administered by a regular full-time staff familiar with the care of the patient being scored. This will ensure consistency and mitigate variations in scoring attributed to discrepancies across scorers. Furthermore, it is imperative to establish standard definitions for parameters, including terms open to interpretation, such as "wound" and "disruptive

behaviour", and ensure that scorers have access to clear and readily referenced definitions in the form.

6.3. Future application in other healthcare settings

Moving forward, the potential of the SAFE score can be further maximised in intermediate to long-term care facilities such as nursing homes, assisted living facilities or shelter homes, where the pool of staff is expected to be regular, and patients stay over a longer duration. Given the scoring can be done easily with minimal hassle to the care team, this score provides a novel metric to ensure these four major domains are, and can be, objectively monitored. It would also serve as a source of motivation, encouraging them to consistently uphold high standards in the interests of the patients' well-being.

7. Conclusion

The SAFE score was designed as a tool for CFH TCF to audit its ability to achieve its goal of maintenance across the four domains. Through this pilot study, with the SAFE score, we have effectively demonstrated that CFH has achieved this goal to ensure safe and smooth transition from acute hospitals to their longer-term discharge destinations. The score has also been useful to the medical team and ground clinicians in early identification of improvements and deterioration for rapid intervention. This novel metric can be easily applied across various healthcare settings, providing valuable insights into the standards of care being provided for the care team and institutional management.

Disclaimer

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