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Can we predict which hospitalised patients are in their last year of life? A prospective cross-sectional study of the Gold Standards Framework Prognostic Indicator Guidance (GSF-PIG) as a screening tool in the acute hospital setting.

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What is already known about the topic?

- Large numbers of hospital inpatients have entered their last year of life.
- A systematic way of screening for these patients would enable focused intervention to improve discussions and planning in relation to care towards the end of life.

What this paper adds?

- This study is the first that we know of to provide prospective evidence that the GSF-PIG is applicable as a screening tool in the acute hospital for those with a limited life expectancy.

Implications for practice, theory or policy?

- A screening tool for those with a short life expectancy in the acute hospital could help systematise interventions to improve outcomes for this group.
- This study suggests that further work to explore the GSF-PIG as a screening tool in the acute hospital setting is warranted.

Abstract

Background: Screening to identify hospital inpatients with a short life expectancy may be a way to improve care towards the end of life. The Gold Standard Framework Prognostic Indicator Guidance (GSF-PIG) is a screening tool that has recently been advocated for use in the hospital setting.

Aim: To assess the clinical utility of the GSF-PIG as a screening tool in an acute hospital setting.

Main outcome measures: Six and 12-month mortality and sensitivity, specificity and predictive value of the GSF-PIG at one year.

Design, Setting, Participants: Prospective cross-sectional study of 501 adult inpatients in a tertiary New Zealand teaching hospital screened utilising the GSF-PIG.

Results: Ninety-nine (99) patients were identified as meeting at least one of the GSF-PIG triggers. In this group six-month mortality was 56.6% and 12-month mortality was 67.7% compared with 5.2% and 10%, respectively, for those not identified as meeting the criteria. The sensitivity and specificity of the GSF-PIG at one year were 62.6% and 91.9% respectively with a positive predictive value of 67.7% and a negative predictive value of 90.0%.

Conclusion: The sensitivity, specificity and predictive values of the GSF-PIG in the present study are comparable to or better than results of studies identifying patients with a limited life expectancy in particular disease states (e.g. heart failure, renal failure). Screening utilising the GSF-PIG in the acute setting could be the first step towards implementing a more systematic way of addressing patient need - both current unrecognised and future anticipated - thereby improving outcomes for this population.

Keywords

Hospital, end of life, prognosis, palliative, screening, GSF-PIG, Gold Standards Framework.

Background

In general, people facing death want their symptoms to be well controlled and wish for more time to prepare themselves and their families for the end of life.[1] In high- and middle-income countries death commonly occurs after a period of chronic illness, rather than suddenly.[2] Early discussions about prognosis are important for patients in order to determine goals of care, enable preparation for death and dying, and allow timely referral to palliative care services, if needed.[3] The reluctance of individual clinicians to discuss prognosis[4] and their inaccuracy when they do so[5] have led to calls for systematic approaches to screening for patients with a short life expectancy, for whom early discussions about prognosis and ongoing support with decision-making may improve outcomes.[6] Prognostic tools may provide a systematic approach for earlier identification of patients who would benefit from these discussions.

The Gold Standards Framework Prognostic Indicator Guidance

The Gold Standards Framework Prognostic Indicator Guidance (GSF-PIG), now widely used in the UK, is an example of a screening tool for patients likely to have a short life expectancy and for whom a programme of care, the Gold Standard Framework (GSF), is advocated.[7] Initially developed for community use, the GSF originally used the 'surprise question' (SQ) as a trigger to identify those for whom specific extra healthcare input might be needed. The SQ relies on the clinician's prediction of survival by asking: *"would you be surprised if this patient died within*

the next year?" An answer of 'no' indicates that the GSF should be implemented. A number of studies have subsequently utilised the SQ from the GSF as a stand-alone screening tool to see whether it can identify those within specific populations (for example dialysis patients) who may have a limited life expectancy.[8-10] More recently, the GSF-PIG has been developed as a more sophisticated screening tool with three triggers as follows: 1) Answering no to the question "*would you be surprised if this patient were to die in the next 6-12 months",* 2) the presence of general indicators of decline (such as decreasing functional performance) and 3) the presence of specific clinical indicators of advanced disease within different illness groups (e.g. COPD, heart disease, renal disease).[11] The GSF-PIG is now being advocated as a screening tool in acute hospitals.[12] If validated in this setting, its use could lead to an increased focus on ensuring good symptom control, discussions about prognosis and goals of care and documentation about future wishes in advance care plans.

Acute hospital setting

A recent study from Scotland by Clark et al. suggests that large numbers of hospital inpatients have entered their last year of life, with 28.8% of a cohort of 10,743 hospital inpatients having died by one year.[13] Of these, one third died during their index admission. The high use of hospital services towards the end of life,[14, 15] with transitions in disease status often occurring during hospital admission,[4] would suggest that hospital clinicians need to discuss prognosis, choices for future care and referral to palliative care services with many hospital inpatients.[16, 17] There is evidence, however, that the needs of this group are not adequately addressed, with referrals to specialist palliative care services in hospital typically occurring late,[18-21] supporting the notion that generalist clinicians in the acute setting under-recognise palliative care

need and under-refer to specialist palliative care.[4, 22] For example in a study carried out by Gardiner et al. in 2010, 30% of a hospitalised population *self-identified* palliative care need versus estimates of need of 15.5% by medical staff and 17.4% by nursing staff.[23] This compared to an estimate of need of 36% using the GSF-PIG in the same study, suggesting that the GSF-PIG may be more accurate than clinician estimates of palliative care need.

Hospitals have pressure to discharge patients quickly[24] so that a screening tool to identify hospitalised patients with a short prognosis may help focus interventions towards those whose end of life needs particularly require addressing. Alternatively hospital screening could provide a flag for a primary care or chronic care provider to pursue this discussion after discharge from hospital, for those who survive the admission.

Aim and Outcomes

The aim of the study was to determine the validity of the GSF-PIG as a screening tool for prognosis in hospitalised patients. The study outcomes were to identify six- and 12- month mortality and the sensitivity, specificity and predictive value of the GSF-PIG at one year in this setting.

Methods

This study comprises one phase of a larger research project exploring key aspects of palliative care management in one urban public hospital in New Zealand. The study was conducted in a 710-bed teaching hospital that provides secondary care for a local

population of 480,000 and most tertiary services for a regional population of 1.4 million people.

Design and Sample: A prospective cross-sectional survey of adult hospital inpatients was undertaken to identify the prevalence and characteristics of patients meeting the GSF-PIG criteria, results of which have been reported elsewhere.[27] The sample excluded patients in intensive care, the emergency department, maternity services and mental health services.

Procedure: Twenty-two wards were surveyed sequentially between May and June 2011, with data collection for each ward completed over no more than one day, thus providing a snapshot of the patients on each ward at a single point in time. The reviewers were two expert palliative care clinicians: a palliative medicine physician (AO'C) and a palliative care nurse practitioner (JR), who did not have a prior relationship with the patients. The reviewers carried out a case note review of each patient in the ward who was over 18 years and resident on the ward at 9am on the day the ward was surveyed. Patients were identified as being likely to be in the last year of life if they met one or more of the GSF-PIG criteria.[11] For these patients additional demographic data was collected. All patients were followed up using National Hospital Index (NHI) numbers (a unique identifier assigned to each individual person receiving health care in New Zealand), to ascertain the number of patients who had died at six months and 12 months.

Data analysis

Data were analysed using SPSS (v20) software. Interval level (survival time) data were analysed using the Kaplan Meier procedure. Survival curves were compared utilising the log-rank test. Analysis of sensitivity, specificity and positive and negative predictive values were performed on nominal data in comparison with death at one

year. In addition the odds ratio and relative risk of dying, if identified by the GSF-PIG, compared with dying if not identified, were calculated. Nominal or categorical data underwent x^2 analyses with a Pearson's test for significance.

Data for the study were acquired in accordance with the Retention of Health Information regulations 1996. Approval for the study was granted by the Northern X Regional Ethics Committee (NTX/10/EXP/144). ADHB institutional approval was granted (project number: A+4864). Key coding was carried out so that only de-identified data were collected on the data forms during the chart review. Patient consent was not required for the data collection. A master sheet linking the data forms with the NHI numbers was stored by the ADHB Decision Support Unit and used by them to obtain mortality data at 6 and 12 months. All other data were stored within secure University computer systems.

Results

'Identified' Patient Characteristics

Ninety-nine (99) of 501 hospitalised patients were identified as meeting at least one of the GSF-PIG triggers.[11] Baseline characteristics for this group included: an average age of 70 years, with the greatest proportion aged over 83 years, a majority NZ European ethnicity (64%), and a primary diagnosis of cancer in less than half (46.5%). The most common non-cancer primary diagnosis was heart disease (11.1%). Nineteen patients had at least one recorded co-morbid condition, 24 had two co-morbid conditions, and 18 had three or more co-morbid conditions. The most common co-morbid conditions reported was heart disease (37.4%) (Table 1).

There was a significant difference in mean age between the identified group ($\bar{\alpha}$ = 70.5, SD = 15.3) and non-identified group ($\bar{\alpha}$ = 57.7, SD = 19.5) ($p < .001$). The two groups did not differ significantly in terms of the numbers of men and women.

[Table 1 here]

Six- and 12-month mortality prediction

Ninety-nine of the 501 patients surveyed (19.8%) were identified by the researchers, using the GSF-PIG, as being likely to die within one year (the 'identified group'). In total, 107 people out of 501 had died by one year, giving a twelve-month mortality for all patients of 21.4%. Of the 99 in the identified group 56.6% (n=56) had died by six months and 67.7% (n=67) by twelve months. Of the 402 group identified as being unlikely to die within one year (the 'non-identified group'), 5.2% (n=21) had died by six months and 10% (n=40) by 12 months. The sensitivity and specificity of the GSF-PIG at one year in this study were thus 62.6% and 91.9% respectively, with a positive predictive value of 67.7% and a negative predictive value of 90.0%. The odds ratio of dying for the 'identified group' versus the 'non-identified group' was at 23.63 at six months (x^2 (1) = 160.9, p = .000) and 18.94 at 12 months (x^2 (1) = 157.6, p = .000) (see table 2).

[Table 2 here]

Patient survival

A significant difference in survival was found between patients in the 'identified group' and the 'non-identified group' with a median survival of 114 days for the 'identified group' (log-rank test $p < .0000001$); see Figure 1). The median survival for the 'non-identified' patients was not reached.

[Figure 1 here]

Discussion

The principal finding of the study is that use of the GSF-PIG criteria, as a screening tool to identify a population of inpatients who were in the last year of life, was highly

specific and moderately sensitive, when used by experienced palliative care clinicians in this hospital setting.

As far as we know, this is the first study to assess prospectively the validity of the GSF-PIG in an acute hospital population. The sensitivity, specificity and predictive values of the GSF-PIG are comparable to, or better than, results of studies identifying patients with a limited life expectancy in particular disease states.

Strengths and limitations of the study

Whilst this study provides unique data regarding the identification of hospitalised patients with a short life expectancy, the study does have several limitations. First, the study was carried out within one acute tertiary hospital in New Zealand, so generalizability of the results should be treated with caution. Second, the assessment, which includes a degree of subjective judgement, was carried out by two specialist palliative care clinicians, who had no prior relationship with the patients. The outcome may have been different if the assessment had been carried out by the generalist clinicians caring for the patients. On the other hand, prognostic accuracy decreases as the relationship with the clinician increases,[26] so screening with this tool may be more accurate when carried out, as in this study, by clinicians who are experienced in hospital palliative care but do not have a close connection with the patient. Finally complete census data was recorded for the identified group only, limiting possible comparisons with the non-identified group in terms of primary diagnosis or co-morbid conditions. Despite these limitations, this prospective study is important as the first to provide empirical evidence for the use of the GSF-PIG as a screening tool across a diverse inpatient population.

Comparison with literature

In terms of what is already known, there have been numerous attempts to develop guides to prognostication, but many of these have focussed on specific illnesses in relation to specific treatment options (such as transplantation), or in the context of clinical trials,[27-29] rather than across a broad inpatient population. More recently tools have been developed in relation to patients with a short life expectancy.[30] Some of these guides use both a clinician's subjective estimate of survival along with actuarial estimation based on specific indices and survival data. The GSF-PIG also uses a combination of clinical judgement - the surprise question (SQ) - and disease specific clinical indicators and over time it is likely that the clinical indicators will improve.

The results from our study compare favourably with previous studies that have utilised the SQ as a stand-alone screening tool for identifying those within specific populations who may have a limited life expectancy.[8-10] In a 2010 study oncologists documented their response to the SQ in 97% of 853 consecutive patients seen in clinic[9]. The odds of dying within one year for the "no" group were 7 times higher than for patients in the "yes" group (HR 7.787, p,0.001); 41% of the "no" group had died versus 3% of the yes group. The sensitivity of the surprise question "no" response was 75% and specificity was 90%. The positive predictive value was 41% and negative predictive value was 97%.[9]

A similar study using the SQ in the peritoneal dialysis population found that the one-year mortality in the "no" group was 24.8% vs. 6.6% in the "yes" group.[10] Multivariate analysis demonstrated that "not surprised if dies in the next 12 months" was an independent predictor of mortality with an excess mortality risk of 3.59 (95% CI: 1.41-9.15; p=0.007). The positive predictive value of this opinion was 24.8% and its negative predictive value was 93.4%. On the other hand, use of the SQ alone as a screening tool has been criticised by others as being inadequate if used as a prompt for referral to palliative care in other non-malignant illnesses such as heart failure and chronic obstructive pulmonary disease.[31] A study in the heart failure population comparing the GSF-PIG with the Seattle Heart Failure (SHF) model in identifying community based chronic heart failure patients in the last year of life, found that neither model accurately predicted which patients were in their the last year of life.[8] Their findings showed sensitivity and specificity as 83% and 22% for the GSF-PIG and 12% and 99% for the SHF with PPV and NPV of 33% and 5% for the GSF-PIG and 83% and 71% for the SHF.

Implications of this research

There is increasing interest in the use of screening tools to improve the overall quality of care for those near the end of life in hospitals.[6] The need for these tools has been highlighted by the recent Scottish study showing that nearly 30% of inpatients died within a year of hospital admission.[13] The GSF-PIG may enable identification of a hospital population for whom particular interventions around end-of-life care is required, either whilst an inpatient or later in the community.

As clinical indicators are refined, the confidence of clinicians to talk to patients about their future care at the end of life, as well as discuss referral to palliative care, should

increase. This is particularly important for those with non-malignant illnesses where disease-modifying (and occasionally potentially curative) therapy can be appropriate alongside a palliative care approach. Examples of good practice include referrals for those with COPD to both rehabilitation and palliative care[32] and the use of the Model for End-stage Liver Disease (MELD) that allows for both liver transplant candidacy and palliative care referral.[33] These examples demonstrate the potential benefits of more sophisticated approaches to screening for end of life needs that incorporate the inherent uncertainty in prognostication.[34] In this way parallel planning can occur in which physical health can be optimised without neglecting preparation for end of life.

Conclusion

This study is the first we know of to assess prospectively the validity of the GSF-PIG as a prognostic screening tool for inpatients in the acute hospital setting. Used by specialist palliative care clinicians, not involved in direct care of the patients, the tool identified a sub-population of approximately 20% of inpatients at high risk of death within a year. Additional studies are needed to determine how the tool will work in the hands of i) generalist clinicians and ii) clinicians with a prior relationship with the patient, and to determine whether use of the GSF-PIG in hospitals can actually lead to improved outcomes for those with a short life expectancy.

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Competing interests

The authors declare that there is no conflict of interest

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Table 1

Baseline characteristics of 'identified' patients (n = 99)

	Frequency	%
Gender		
Male	47	47.5
Female	50	50.5
Transgender	1	1.0
Unknown	1	1.0
Age		
Lowest -49	11	11.1
50-60	17	17.1
61-71	20	20.2
72-82	22	22.2
83 and older	29	29.3
Ethnicity		
New Zealand European	64	64.5
Maori	7	7.1
Samoan	4	4.0
Tongan	3	3.0
Niuean	2	2.0
Fijian	1	1.0
Chinese	4	4.0
Other European	11	11.1
Unknown	3	3.0
Primary Diagnosis		
Cancer	46	46.5
Heart Disease	11	11.1
Renal	8	8..1

Chronic Obstructive Pulmonary Disease	5	5.1
Frailty	5	5.1
Dementia	3	3.0
Parkinson's disease	3	3.0
Stroke	1	1.0
Other	6	6.1
Unknown	11	11.1

Table 2

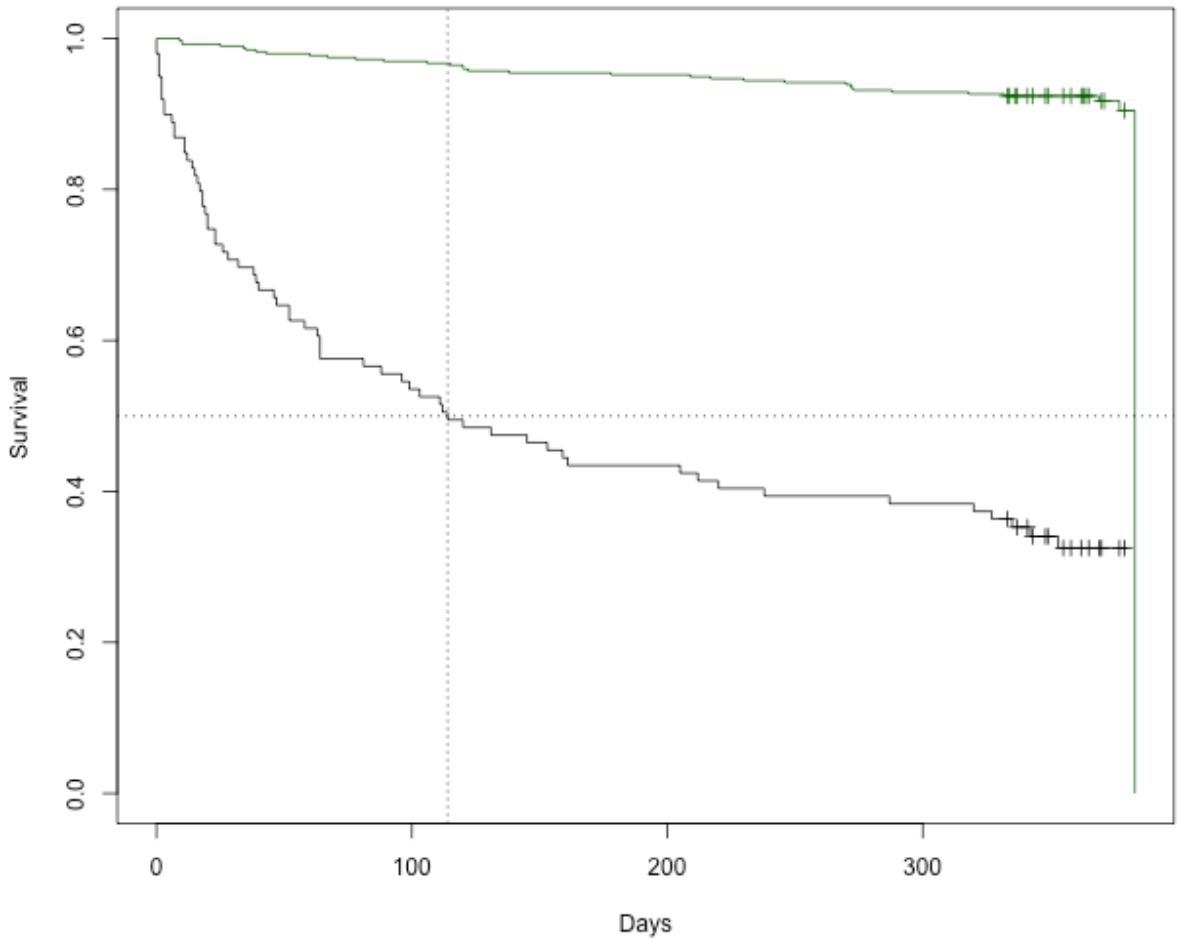
Relative Risk and Odds Ratio of death between 'identified' (n = 99) and 'non-identified' (n = 402) groups at 6 and 12 months

Time	Group	Deaths	Relative Risk	95% CI	Odds Ratio	95% CI
6 months	'Identified' group	56	10.82**	6.89-16.99	23.63**	12.57-44.75
	'Non-identified' group	21				
12 months	'Identified' group	67	6.80**	4.91-9.40	18.94**	10.76-33.53
	'Non-identified' group	40				

** $p < .001$

Figure 1

Survival for 'identified' and 'non-identified' patients



Green line – 'non-identified' patients

Black line - 'identified' patients

Median time to death for 'identified' patient's 114 days