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Letter

Likelihood of Death Within One Year Among a National Cohort of Hospital Inpatients in Scotland

To the Editor:

In an earlier study, we took a census of all inpatients in the 25 teaching and general hospitals of Scotland on a single date in 2010 and then linked the hospital patient records to records of death registration. We found that almost one-third of the patients in hospital on the census date died within 12 months.¹ Could we assume that these findings would be replicated on any other day in Scotland's hospitals? To assess the robustness of the original findings of our census, we sought to test whether the results from the 2010 cohort of inpatients in Scotland would be repeated on a subsequent census date, three years later, in 2013. Answering this question would help us to build on the significant policy and public impact of the original study² and might also assist in national policy efforts to identify patients for palliative and advance care planning conversations in the hospital setting.³

The purpose of our follow-up study, therefore, was one of verification.

Methods

Cohorts

The original census date was March 31, 2010. The follow-up census date was April 10, 2013. Both dates were Wednesdays and avoided public holidays. Patients were counted as being in hospital overnight on the census dates if they had a Scottish Morbidity Record Scheme 01 (SMR01) episode where the admission date was one of the two census dates or earlier, and where the discharge dates were one or more days later. Long-stay elderly patients were excluded. The SMR01 includes all inpatient and day case discharges from nonobstetric and nonpsychiatric specialties in National Health Service hospitals in Scotland. Each census included all inpatients from those hospitals in Scotland in which most acute clinical activity

occurs—seven teaching hospitals and 18 large general hospitals.

The measure of deprivation used is the Scottish Index of Multiple Deprivation for 2009 and 2012 (SIMD09/12).⁴ This is an area-based deprivation score that groups the Scottish population into five equal quintiles, with Quintile 1 representing the 20% most deprived areas in Scotland and Quintile 5 the least deprived. Patients are assigned a deprivation score based on the quintile in which their postcode is located. The National Records of Scotland provided information on deaths including dates of death.

Statistical Analyses

Comparisons between the cohorts from the two dates, March 31, 2010 and April 10, 2013, were made from cross-tabulations of the explanatory variables—gender, age, deprivation, and specialty. The risk of dying, the cumulative hazard, was calculated in the two cohorts separately using the Cox proportional hazard regression model. Each of the explanatory variables gender, age, deprivation score, and type of admission (surgical, medical, other) were fitted in the model. The time variable used was the number of days from the census date to the patient's death. A patient was censored if he or she did not die within 365 days after the census date. An unadjusted hazard ratio (HR) between the cohorts was calculated, and a multivariate model, using all the explanatory variables, was used to calculate adjusted HRs for the two cohorts separately and in analyses from the combined cohort.

A Kaplan-Meier plot was used to compare the survival curves of patients in 2010 and 2013, and the log rank (Mantel-Cox) was used to test if there was a statistically significant difference between the survival curves of patients in 2010 and 2013.

Results

On the census dates in 2010 and 2013, 10,738 and 10,595 patients were in hospital, respectively (Table 1). The population characteristics of the inpatients in 2010 and 2013 were very similar. In both years, there was a small excess of women compared

Table 1
Likelihood of Death in Two Cohorts of Inpatients in Hospitals in Scotland in 2010 and 2013

Patient Characteristics	March 31, 2010		April 10, 2013	
	Deceased	Survived	Deceased	Survived
	<i>N</i> = 3093	<i>N</i> = 7645	<i>N</i> = 3126	<i>N</i> = 7469
	% of <i>N</i>	% of <i>N</i>	% of <i>N</i>	% of <i>N</i>
Gender				
Male	48	44	48	45
Female	52	56	52	55
Age				
Under 60	13	34	11	33
60–64	6	9	5	8
65–69	10	9	10	10
70–74	11	11	13	10
75–79	16	13	16	12
80–84	18	11	19	12
85 and over	26	13	27	14
Deprivation (SIMD 2012)				
Q1 (most)	28	27	28	28
Q2	23	23	24	23
Q3	18	19	17	18
Q4	16	17	16	16
Q5 (least)	14	14	15	14
Missing	0	1	0	1
Specialty				
Surgical	22	43	20	39
Medical	74	56	77	59
Others ^a	3	1	3	1

^aOthers: Oral surgery, GP beds other than obstetrics, and clinical oncology.

to men (55% women in 2010 and 54% in 2013). Most of the patients were in medical departments (61% in 2010 and 65% in 2013). Younger patients (<60) comprised 28% and 27%, whereas older patients (≥80) comprised 30% and 32%, in 2010 and 2013, respectively. The distribution with regard to deprivation was the same in 2010 and 2013, with 28%, 23%, 18%, 16%, and 14% in Quintiles 1, 2, 3, 4, and 5, respectively. The proportions of those who died in each year were almost the same—29% for 2010 and 30% for 2013. Similarly, in 2010, 9% died during the census admission, compared to 8% in 2013 (data not shown).

The distributions of different explanatory variables in those who died and those who survived in the two cohorts were very similar in 2010 and 2013. The survival curves of the 2010 and 2013 cohorts proved to be almost identical. The risk of dying within one year from the index date in the 2010 cohort was 1.01 (95% CI: 0.96, 1.06) times the risk in the 2013 cohort, so no “cohort-effect” could be demonstrated.

Men were slightly more likely to die than women. The proportions of patients older than 80 were much higher in the group that died (44%/46% in 2010/2013) compared to the group that survived (24%/26% in 2010/2013). Most of those who died were in medical, rather than surgical, departments on the census date (74%/77% in 2010/2013).

In the absence of differences between them, the two cohorts were combined in our analyses of HRs. In the overall analysis of the combined cohort, the risk of death among men compared to women was 1.2 (95% CI: 1.2, 1.3). Patients aged 85 years and older were 4.1 (95% CI: 3.7, 4.5) times more likely to die than those aged younger than 60 years. No statistically significant association was found between risk of death and deprivation. Patients admitted to a medical specialty were 1.9 (95% CI: 1.7, 2.0) times more likely to die than those admitted to a surgical specialty. The difference between medical and surgical departments, showing almost double the risk of death within one year among inpatients in medical departments compared to surgical, led us to analyze HRs separately for medical and surgical departments. Men had a small, but significantly higher risk of death in both types of specialties. The risk increased with age. In medical departments inpatients of 85+ years had a 3.6 (95% CI: 3.2, 4.0) higher risk of death compared to those younger than 60 years, and in surgical departments, the risk was 7.1 (95% CI: 5.9, 8.6) times higher. The level of deprivation did not seem to influence the risk of dying, with the exception of inpatients in surgical departments from the most deprived areas, who had a 1.2 (95% CI: 1.0, 1.4) times higher risk of death compared to those from the least deprived areas.

Comment

The 2013 repeat of the study from 2010 demonstrated no significant differences between the two cohorts of inpatients in Scotland, both in their overall characteristics and in their propensity to die within one year. We are, therefore, more confident that this is the prevalent situation in Scottish hospitals. The results of the first study were not a “one off.” We encourage others to repeat our study in other countries, as well as in individual hospitals.⁵ We believe our results support more investment in the identification, and subsequent care, of hospital patients who are likely to be in the last year of life.⁶ A proportion of these patients may welcome the chance to discuss their preferences for care and support as they approach the end of life, a recommendation in line with policy and legal directives in many countries.^{7–9}

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