AutoSPICT – Identifying End of Life Care Needs using an SQL implementation of the SPICT™ Questionnaire

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Background

Palliative care in the community reduces hospitalisations, distress, and healthcare costs. Statistical estimates suggest that, in high income countries, between 69% and 82% of decedents will have had palliative care needs. The SPICT™ clinical tool is a short questionnaire used by clinicians to determine if a seriously ill patient is indicated for palliative care.[1] This evaluation typically takes place during an acute episode of care, which is an inopportune time to raise complex questions regarding end of life wishes.[2] Delaying the end of life conversation has consequences for population health, with large quantities of resources being expended prolonging the lives of patients who may not have been asked if they even want such interventions.

An automated implementation of the SPICT™ questionnaire could proactively and precisely identify the cohort of patients with palliative needs, allowing primary care physicians to deliver better care.

Methods

Retrospective analysis was conducted on coded EHR data for 1,402,251 patients registered with NHS Nottinghamshire. We implement a version of the SPICT™ questionnaire by following these **five** steps:

1. We **clarified the criterion** where it was under-specified. For instance, we define 'recurrent variceal bleeds' as '2 or more instances of variceal bleeds'.
2. We **searched for existing concepts** relevant to the criterion. For instance, for the liver disease criterion "Cirrhosis with one or more complications in the past year out of: diuretic resistant ascites, hepatic encephalopathy, hepatorenal syndrome, bacterial peritonitis, variceal bleeds", five relevant concepts existed: cirrhosis, encephalopathy, hepatorenal syndrome, and bacterial peritonitis.
3. We **created new concepts** where the existing concepts did not suffice, for instance curating relevant ICD and SNOMED CT codes for "variceal bleeds". We note that some concepts would not be exactly recorded, and we consulted with a clinician to determine how ambiguous concepts might be recorded e.g. we encoded the criterion "difficulty with swallowing" with the concept "liquid foods".
4. To express the criterion as they exist in SPICT™, **we wrote logic combining concepts**. For instance, the liver disease criterion mentioned in Step 2 can be implemented using the logic decided in Step 1 and the simple five existing concepts mentioned in Step 2, as shown in Figure 2. We note that the complication "diuretic resistant ascites" has been omitted as this information would not be clinically coded.
5. A clinician and analyst jointly **reviewed** the *AutoSPICT* concept and corrected clinical and technical innacurracies.

We compare our implementation to an earlier population-level palliative care search algorithm, described in prior art by Mason et al.[3] (MasonSPICT). We evaluate these cohort selection algorithms on their agreement with existing palliative care provision in NHS Nottingham (↑) and on their capacity as predictors of 12-month mortality (↑) between 01/08/2023 and 01/08/2024.

Results

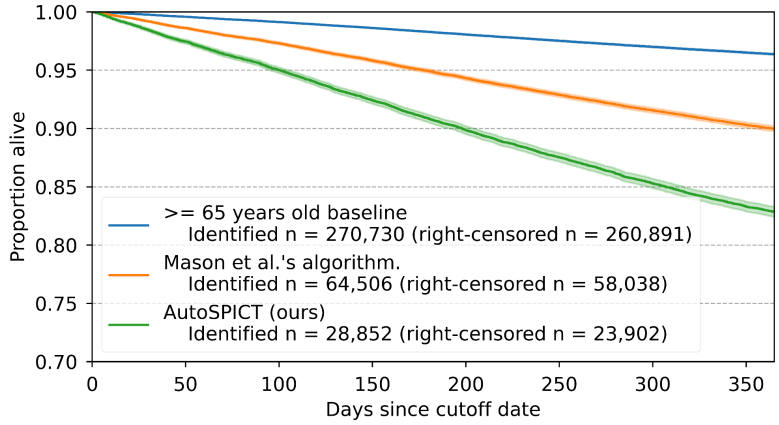

Figure 1: Retrospective Kaplan-Meier survival curves showing how those patients identified by AutoSPICT have a higher mortality rate 12-months post-identification than do those identified by MasonSPICT or by a baseline consisting of individuals aged 65 and over.

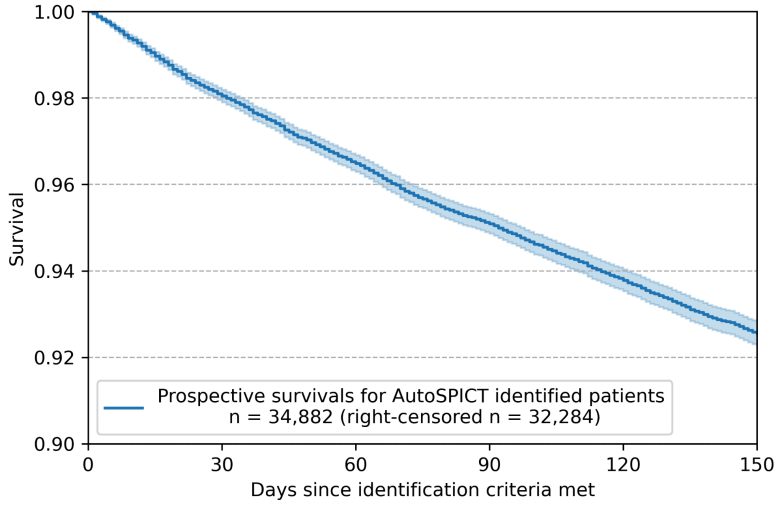

Figure 2: Prospective Kaplan-Meier survival curve showing the observed mortality rate of patients identified by AutoSPICT on January 1st 2025, and their mortality to the present day.

	MasonSPICT -	MasonSPICT +	AutoSPICT -	AutoSPICT +
Frequency	1,305,318	64,506	1,373,399	28,852
Socio-demographics (median [IQR])				
Age	38 [21, 58]	72 [58, 83]	39 [22, 59]	79 [69, 86]
Sex = Female (%)	49.67	54.11	48.60	54.93
Deprivation Decile	5 [2, 8]	5 [2, 8]	5 [2, 8]	5 [2, 8]
Ethnicity (%)				
White	71.31	90.29	70.12	94.39
Asian	9.16	3.75	8.77	2.47
African/Caribbean/Black	4.38	2.23	4.21	1.41
Mixed/Multiple ethnic group	3.39	1.29	3.27	0.68
Other ethnic group	1.76	0.66	1.68	0.40
Ethnicity Not Recorded	10.0	1.79	11.94	0.64
Comorbidities (%)				
0	63.31	6.56	62.99	0.46
1	21.70	15.90	21.32	4.07
2	8.73	20.90	9.02	10.73
3	3.64	19.60	3.96	17.77
4	1.57	15.27	1.71	22.20
5+	1.04	21.78	1.01	44.77
Place of living (%)				
Own residence	99.65	90.10	99.62	81.58
Care home	0.35	9.90	0.38	18.42
End Of Life Interventions				
On Palliative Care Register	2,403 (0.18%)	6,986 (10.83%)	3,279 (0.24%)	6,110 (21.18%)
ReSPECT form completed	2,010 (0.15%)	7,770 (12.05%)	3,055 (0.22%)	6,725 (23.31%)
Deaths	5,227 (0.40%)	6,468 (10.03%)	6,746 (0.49%)	4,950 (17.16%)

Table 1: Sociodemographics, comorbidities, and existing End of Life interventions for patients who are (+) and are not (-) identified by MasonSPICT and AutoSPICT: AutoSPICT identifies a higher mortality rate segment (AutoSPICT+) of the population with greater agreement on existing end of life care interventions than compared to the population identified by MasonSPICT (MasonSPICT+). The proportion of those identified who were already on the NHS palliative care register, and those who had completed an end of life wishes 'ReSPECT' form. Each patient's deprivation decile value is derived from each patient's postal code using UK government statistics, with ten being the most deprived decile.[4]

Table 1 shows that patients identified with AutoSPICT are more likely to be older, female, white, suffer multi-morbidity, and to live in a care home (Table 1). We investigated the reason for more females being identified, and found a greater proportion of the patients meeting the 'Dementia / Frailty' criteria (11,019) to be female (63.69% i.e. 7,018) compared to male (36.3% i.e. 4001). AutoSPICT has identified approximately half the number of patients that MasonSPICT did (64,506 vs 28,852), however inspection of the palliative care interventions shows that a higher proportion of these patients are already clinically identified as in need of palliative care interventions, suggesting that this group may be more relevant. This is supported by the greater proportion of deaths in the AutoSPICT-positive than the MasonSPICT-positive group. High precision is important for clinical utility, as time-pressured clinicians do not want to sift through many false positives to identify rare true positives. Figure 2 provides evidence that AutoSPICT identifies a cohort at high risk of mortality in a six-month prospective trial.

Conclusion

In this work we created a digital implementation of the SPICT™ questionnaire for identifying palliative care needs in seriously ill patients, which we term AutoSPICT. We validated AutoSPICT and another algorithm from the literature on their agreement with existing clinical interventions and predictive capacity for 12-month mortality in a population of over 1.4 million patients in Nottingham and Nottinghamshire NHS. We have begun the creation of an OMOP-CDM version of AutoSPICT, with the aim of collaborating with other CDM users to validate the algorithm in other healthcare environments, to improve the codesets and to develop superior pipelines for surfacing palliative care needs.

References

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