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## Survival prediction for advanced cancer patients in the real world: A comparison of the Palliative Prognostic Score, Delirium-Palliative Prognostic Score, Palliative Prognostic Index and modified Prognosis in Palliative Care Study predictor model

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## KEYWORDS

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**Abstract Purpose:** The aim of this study was to investigate the feasibility and accuracy of the Palliative Prognostic Score (PaP score), Delirium-Palliative Prognostic Score (D-PaP score), Palliative Prognostic Index (PPI) and modified Prognosis in Palliative Care Study predictor model (PiPS model).

**Patients and methods:** This multicentre prospective cohort study involved 58 palliative care services, including 19 hospital palliative care teams, 16 palliative care units and 23 home palliative care services, in Japan from September 2012 to April 2014. Analyses were performed involving four patient groups: those treated by palliative care teams, those in palliative care units, those at home and those receiving chemotherapy.

**Results:** We recruited 2426 participants, and 2361 patients were finally analysed. Risk groups based on these instruments successfully identified patients with different survival profiles in all groups. The feasibility of PPI and modified PiPS-A was more than 90% in all groups, followed by PaP and D-PaP scores; modified PiPS-B had the lowest feasibility. The accuracy of prognostic scores was  $\geq 69\%$  in all groups and the difference was within 13%, while c-statistics were significantly lower with the PPI than PaP and D-PaP scores.

**Conclusion:** The PaP score, D-PaP score, PPI and modified PiPS model provided distinct survival groups for patients in the three palliative care settings and those receiving chemotherapy. The PPI seems to be suitable for routine clinical use for situations where rough estimates of prognosis are sufficient and/or patients do not want invasive procedure. If clinicians can address more items, the modified PiPS-A would be a non-invasive alternative. In cases where blood samples are available or those requiring more accurate prediction, the PaP and D-PaP scores and modified PiPS-B would be more appropriate.

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## 1. Introduction

Accurate prognostic information is of marked importance in palliative care settings for patients to make decisions and set goals and priorities [1]. Although the clinical prediction of survival is generally useful to formulate a prognosis in clinical practice, clinical prediction alone is limited in accuracy and inclined towards overestimation [2]. Multiple prognostic scores have thus been developed to provide clinicians with more accurate information on the prognosis of advanced cancer patients [1,3,4].

Prognostic instruments that have undergone the most evaluation are the Palliative Prognostic Score (PaP score) and Palliative Prognostic Index (PPI) [5–8]. Both were presented in 1999 by independent research groups from Italy and Japan. The PaP score was initially developed in hospice care services [5,6], and subsequently validated with independent prospective cohorts of patients treated by hospital palliative care teams, in inpatient hospices/palliative care units, in acute care/oncology settings and on a paediatric ward [9–15]. The PPI was initially developed in a palliative

care unit [7,8], and thereafter independently validated in hospital palliative care teams, home palliative care services and acute care hospitals [16–19]. One limitation is that while these two prognostic scores were successfully validated in common palliative care settings in separate studies, few studies directly compared different prognostic tools [19,20], leaving clinicians unclear on which tool to use in practice.

In addition, recently, an Italian team created a modified version of the PaP score, the D-PaP score, integrating delirium as an additional predictor [21]. Moreover, a novel prognostic indicator, the Prognosis Palliative Care Study (PiPS) predictor models, has been proposed in the United Kingdom (U.K.), and this model was validated by independent groups [22–24]. These new prognostic instruments, however, have not yet been fully validated in other palliative care settings especially in comparison with existing tools [23,24].

Moreover, palliative care has been becoming increasingly integrated in oncology for patients with earlier stages of cancer [25,26], and simultaneously proportion receiving chemotherapy within 14 days of death have also a tendency to increase recently [27,28]. Very few

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