Latent class analysis identifies three subtypes of aggressive end-of-life care: A population-based study in Taiwan

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Abstract   The aggressiveness of end-of-life (EOL) cancer care has often been analysed by the occurrence of several indicators, separately or aggregately. Whether aggressive EOL cancer care has different subtypes is unknown. This study sought to identify distinct subtypes of aggressive EOL care based on usage patterns of aggressive EOL-care indicators and to explore demographic, disease and treatment factors associated with the identified subtypes.

This retrospective study linked data from 2001 to 2006 from three Taiwanese databases: National Registration of Death Database, Cancer Registration System and National Health Insurance claims database. Adult cancer patients ($N = 203,642$) who died in 2001–2006 were selected. For these cancer patients' last month of life, we analysed eight indicators of aggressive EOL care: receiving chemotherapy, >1 emergency room visit, >1 hospitalisation, hospitalisation for >14 days, intensive care unit admission, received cardiopulmonary resuscitation, received intubation and received mechanical ventilation. Subtypes of aggressive EOL care were identified by latent class analysis.

Among the study population, only 22.3% were treated by medical oncologists. Based on their profiles of EOL care, deceased cancer patients were classified into three subgroups: 'not aggressive' (45%), 'intent to sustain life' (33%) and 'symptom crisis' group (22%). Patients assigned to the 'intent to sustain life' group were less likely to have metastatic disease and to receive hospice care in the last year of life, but more likely to be cared for by non-medical oncologists, to die within 2 months after diagnosis and to die in hospital. EOL cancer care may be improved by understanding factors related to different subtypes of aggressive EOL care.

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1. Introduction

Poor quality of end-of-life (EOL) care has been identified in focus groups by performance measures that are available in administrative data.[1,2] These performance

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measures are overuse of anti-cancer treatment, underuse of hospice services or dying in an acute setting and misuse of aggressive intervention near death.[1,2] Except for underuse of hospice and dying in an acute setting, the other two measures are related to aggressive treatment and procedures with the intent to cure the disease or sustain life. In other words, aggressive EOL care has been equated in essence with poor quality EOL care. The quality of EOL cancer care can be assessed by several identified indicators.[1,2] These indicators include lack of or late hospice referral, death in an acute care hospital, use of chemotherapy in the last 14 days of life and frequent treatment of health crises associated with the dying process, e.g. >1 emergency room (ER) visit, >1 hospital admission, lengthy hospitalisation and use of intensive care unit (ICU). These indicators have been adopted to illustrate the quality of EOL cancer care by researchers from the United States,[3,4] Canada,[5,6] Portugal,[7] Japan,[8] Korea[9] and Taiwan.[10,11] In most of these studies, the occurrence of each indicator is presented separately, but this approach often hinders making an overall judgment about the quality of EOL care.

To obtain a global picture of the aggressiveness of EOL cancer care, researchers have developed composite scores using different combinations of the above-mentioned indicators. For example, Tang and colleagues represented the degree of overall aggressiveness of EOL cancer care by a sum score (range = 0–6) based on the occurrence of six indicators: use of chemotherapy, >1 ER visit, >1 hospital admission, >14 days of hospitalisation, an ICU admission or death in a hospital.[10] The authors assumed that all these indicators were measuring the same single underlying construct and contributed equally to aggressiveness of EOL care, which has not been validated and might not be justified. Patients with the same aggressiveness score may experience totally different EOL care. For example, an aggressiveness score of two might result from two different conditions: receiving chemotherapy and admission to ICU or having multiple ER visits and >14 days of hospitalisation.

Another binary composite score was based on the occurrence of at least one of four indicators: received the last dose of chemotherapy within 14 days of death, had >1 emergency department visit within 30 days of death, had >1 hospitalisation within 30 days of death or had at least one ICU admission within 30 days of death.[6] This approach also treated each indicator equally. Furthermore, the occurrence of more indicators did not yield a higher score; in other words, different types of aggressive treatment were lumped together and could not be differentiated.

Using a composite score only gives a rough picture of the aggressiveness of EOL care for a specific population. However, each individual may have different configurations of EOL care. It is unknown whether aggressive

EOL care can be categorised into distinct types and whether certain types of aggressive EOL care are associated with undesired outcomes such as dying in a hospital or whether palliative care influences the type of EOL care received. Rather than creating a new composite score to quantify the degree of aggressiveness in EOL care, the main objective of this study was to identify distinct subtypes of aggressive EOL care based on the response patterns of indicators of aggressive EOL care in a population-based sample of decedent adult cancer patients in Taiwan. The secondary objective was to explore factors associated with the identified subtypes of aggressive EOL care.

2. Patients and methods

2.1. Study design and sample

This retrospective study linked data from three Taiwanese databases: National Registration of Death Database (NRDD), Cancer Registration System (CRS) and National Health Insurance (NHI) claims database. The CRS included 97.3% of incident cancer occurrences with 98.6% completeness and 86.5% to 90.8% accuracy.[12] The universal health insurance coverage policy in Taiwan ensures that the NHI covered 99% of Taiwan's population at the end of 2008.[13] In the current study, adult cancer decedents were included if their age at death was ⩾19 years. Date of death and demographic information were retrieved from the NRDD. Information on cancer diagnosis and date of diagnosis was obtained from the CRS. Comorbidity, metastatic status, health care resource utilisation and hospital characteristics were obtained from the NHI claims database. The primary physician's specialty was retrieved from the NHI claims and was dichotomised into medical oncologists (including hematologists but excluding radiation oncologists, surgical oncologists and gynaecological oncologists) and non-medical oncologists.

2.2. Indicators of aggressive EOL care

Drawing on previous studies,[3,10,11] we selected eight indicators of aggressive EOL care in cancer patients' last month of life: receiving chemotherapy, >1 ER visit, >1 hospitalisation, hospitalisation for >14 days, admission to ICU, received cardiopulmonary resuscitation (CPR), received intubation and received mechanical ventilation. Detailed definitions of these indicators and how they were retrieved from the databases can be found elsewhere.[11]

2.3. Statistical analysis

To identify subtypes of aggressive EOL care, we assumed that the patterns of use for eight observable