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POSTER ABSTRACT

Development and Evaluation of a Novel Population Needs-Based Sub-Segmentation Model (NBSSM) in Singapore

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Background: Population segmentation models are often used to stratify people into groups for care or services planning purposes. These are typically disease-specific or utilisation-based, and target high-risk patient groups. Singapore's National Health Group (NHG) has developed a River of Life (RoL) segmentation approach stratifying its population into five segments, namely, Living Well, Living with Illness, Crisis and Complex Care, Living with Frailty and Leaving Well. Building on this approach, Yishun Health (YH), a Regional Population Health System under NHG caring for more than 300,000 residents in Northern Singapore, developed the Needs-Based Sub-Segmentation Model (NBSSM) to further stratify Yishun Zone residents who are living with illness and frailty using additional biological, psychological and social criteria. We evaluated the NBSSM's ability to stratify residents into distinct risk-groups based on a set of person-centred outcomes.

Methods: Yishun Zone residents with chronic illness and/or frailty were first identified to generate 'Living with Illness' and 'Living with Frailty' groups. These residents were further segmented into 10 sub-segments representing different needs and complexity levels, based on biological complexity i.e. number and severity of chronic diseases, as well as presence or absence of psychosocial criteria i.e. presence of mental illness and social issues.

To evaluate the NBSSM, we studied its ability to stratify residents into distinct risk-groups using Charlson's Comorbidity Index (CCI) scores as well as person-centred outcomes such as healthcare utilisation, and healthcare cost. Statistical distinction between NBSSM segments based on the above outcomes was also tested. Data from a Population Health Survey being conducted by YH, which included health behaviours and more detailed mental and social needs data, will next be integrated into the NBSSM to forecast the needs under each sub-segments to enable services planning for segment-specific interventions.

Results: All 314,522 Yishun Zone residents were included for RoL segmentation, of which 53,653 residents known to YH were further sub-segmented by the NBSSM according to their biopsychosocial needs. CCI, healthcare utilisation (i.e. number of Emergency Department visits, Specialised Outpatient Clinic visits, admissions and annual bed-days), and annual total healthcare cost were found to be statistically different across the NBSSM segments ($p<0.05$). Residents with presence of mental health and social issues had significantly higher risk of healthcare utilization and cost.

Discussion & Conclusion: Using only data that was readily available data in our electronic medical record system, the NBSSM was able to augment NHG RoL segmentation and effectively sub-segment the Yishun Zone resident population into mutually exclusive and collectively exhaustive groups with similar magnitude of risk of health needs and outcomes.

NBSSM enables development of more targeted and aligned clinical governance and leadership of segment-specific interventions through clearer assignment of segment-specific accountability for population outcomes. Integrating comprehensive needs assessment data from the YH Population Health Survey will enable more coherent health system and services planning.

In conclusion, needs-based segmentation models are more person-centred than disease-specified or utilization-only segmentation models. NBSSM enhances our health system's system transformation and service planning capabilities to direct targeted interventions to meet needs and improve population health outcomes.