The Estimation of Nursing Cost and Nursing Service Weights of Malaysian DRG (MY-DRG) in a Teaching Hospital, Universiti Kebangsaan Malaysia Medical Centre (UKMMC)

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Introduction
Nurses are the largest contributor to patient services in hospitals and have major contribution in the inpatient care. Although, cost of nursing has increasingly being studied in many other countries for several purposes, no such study has been done in Malaysia. Hence, due to the high operating and labor cost in the hospital, it is very crucial in today's healthcare practice to measure the cost of nursing. This study aims to impute the nursing costs and nursing service weights (NSW) of MY-DRG for inpatients at a teaching hospital in Malaysia.

Methods
This study was carried out in UKMMC from November 2012 to August 2014. UKMMC is the first teaching hospital in Malaysia to use the Casemix system with the main purpose is to improve the quality of care and managing hospital resources efficiently. All the four years of hospital inpatients data, from 2009 to 2012 were gathered and included in the study. The data was obtained from the Casemix database for inpatients and were grouped using MY-DRG, the casemix system specifically developed for Malaysian. Costing study was conducted using a combination of Top Down and Activity Based approach. The hospital costing data were obtained from five departments including Finance, Human Resource, Nursing Management, Maintenance and Health Information Department of UKMMC. Clinical Cost Modeling software (CCM Version 3.0) was used to calculate cost per day of stay in the Top-down method to assist in the development of nursing service weights. The Activity-Based costing method was used to impute cost of nursing care based on the nursing service time for selected cases and disciplines. Total cost of nursing services for each MY-DRG Group were calculated and the costing data was trimmed using L3H3 method to handle the outliers. Finally, NSW for each MY-DRG was imputed.

Results
A total of 90,581 discharges were grouped into 708 MY-DRG groups. Four MY-DRG groups were excluded after the data was trimmed and the remaining 80,542 discharges were included in the final analysis. For non-surgical cases, three out of ten highest nursing service weight, were from CMG F (Mental Health and Behavioral Groups), five from CMG U (Ear, Nose, Mouth and Throat Groups) and two from CMG H (Eye and Adnexa Groups). For surgical cases, four out of ten highest nursing service weight were from CMG M (Musculoskeletal System & Connective Tissue Groups, two CMG U ((Ear, Nose, Mouth and Throat Groups), two CMG G (Central Nervous system), one CMG N (Nephro-urinary System Groups and one from CMG L (Skin, Subcutaneous Tissue and Breast Groups). MY-DRG with the five highest nursing cost for surgical and non-surgical cases were presented here. The Non-surgical cases are: H-4-12-I (Other Eye Diseases-Mild; 0.2298), followed by F-4-15-I (Phobia Anxiety and Other Neurosis-Mild; 0.2164), H-4-12-II (Other Eye Diseases-Mild; 0.2135), F-4-14-I (Depressive Disorders-Mild; 0.2106), U-4-13-II (Epiglotitis Upper Respiratory Tract Infection Laryngotraceitis and Otitis Media; 0.2097). For surgical cases, the top five nursing cost weights are: M-1-40-II (Local Excision & Removal of Internal Fixators; 0.1133), followed by U-1-20-II (Other Ear Nose Mouth and Throat Operations; 0.1133), M-1-60-III (Other Operations of Musculoskeletal System and Connective Tissue-Major; 0.1133), U-1-12-I (Sinus and Mastoid Operation-Minor; 0.1133), G-1-20-I (Cranial and Peripheral Nerve Operation-Minor; 0.1133).

Conclusions
The Nursing Service Weights in this study shows the variability of resources in nursing care among MY-DRG groups. The high Nursing Service Weights reflects the high nursing resources consumption for the particular MY-DRG groups. However the result also revealed the homogeneity of Nursing Service Weights
in some MY-DRG groups. The output of this study can help decision makers in designing appropriate incentive package for reimbursement of nursing services.

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