

## **Project Title**

End-stage organ disease–Healthcare utilisation: Impact of Palliative medicine

## **Project Lead and Members**

Project lead: Allyn Hum

Project members: Yap Chun Wei, Mervyn Koh

## **Organisation(s) Involved**

- Palliative Medicine Department, Tan Tock Seng Hospital
- The Palliative Care Centre for Excellence in Research and Education (PaIC)
- National Healthcare Group Health Services and Outcomes Research (NHG HSOR)

## **Healthcare Family Group(s) Involved in this Project**

Medical, Healthcare Administration

## **Specialty or Discipline**

Palliative Medicine, Health Services Outcomes Research

## **Project Period**

Start date: 1<sup>st</sup> January 2014

Completed date: 31<sup>st</sup> December 2017

## **Aims**

To determine if palliative care referrals reduced healthcare utilisation, and if the impact on healthcare utilisation was dependent on the timing of the referral

## **Background**

See poster appended / below

## **Methods**

See poster appended / below

## Results

See poster appended / below

## Lessons Learnt

- (1) Patients with end stage organ disease (ESOD) in this study experienced a reduction in the frequency of emergency department visits, inpatient hospital admissions, length of stay and charges with palliative care support compared with patients who did not.
- (2) Timeliness of palliative care referral affected healthcare utilisation in this study. The greatest reduction in healthcare utilisation occurred with patients referred at least 1–6 months before death. However, the majority of patients were referred in the last month of life, reflecting a worldwide trend
- (3) The disproportionately low referral to palliative care for End Stage Organ Disease may reflect the lack of training, education and palliative care awareness amongst healthcare professionals

## Conclusion

See poster appended / below

## Additional Information

Singapore Health & Biomedical Congress (SHBC) 2021: Best Poster Award (Health Services Research) – Gold Award

## Project Category

Care Continuum, End-of-life care, Palliative Care

## Keywords

End Stage Organ Disease, Healthcare Utilization

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# Impact of Palliative Care On Healthcare Utilization for End Stage Organ Disease

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## Background

With exponential population growth and global aging, death secondary to non-cancer diseases will increase. [1,2] Despite significant contribution to worldwide mortality from non-cancer illnesses, patients with end stage organ disease (ESOD) have differential access to palliative care although physical suffering and psychosocial needs increase in prevalence in the last year of life. Delivering cost-effective care in end stage organ diseases is challenging given their protracted duration of illness, and pattern of decline characterized by “entry-re-entry” disease trajectories. As in end stage cancer, suffering in ESOD is significantly burdensome, with evidence of the beneficial effects of palliative care on symptom burden and quality of life.[3] However, less well documented is the impact of palliative care in ESOD in relation to health resource utilization.

## Aims

**Primary aim:** To determine if palliative care referrals reduced healthcare utilization.

**Secondary aim:** To examine if the impact on healthcare utilization was dependent on the timing of the referral.

## Methods

**Study design:** Retrospective cohort study using Coarsened exact matching (CEM) and propensity score matching (PSM) to compare patients with end-stage organ diseases (ESOD) who received palliative care support with those who did not.

## Results

Table 1: Profile of matched and unmatched patients who were referred and not referred to palliative care

	Matched patients		Unmatched patients	
	Referred to palliative care	Not referred to palliative care	Referred to palliative care	Not referred to palliative care
<b>No. of patients</b>	1110	1110	268	1813
<b>End Stage Organ Disease (ESOD)</b>				
Heart failure	17.6%	17.7%	11.9%	13.2%
Respiratory failure	7.6%	7.7%	9.3%	4.4%
End stage renal failure	57.7%	57.1%	31.3%	41.5%
End stage liver disease	12.5%	12.7%	45.1%	5.3%
Advanced dementia	24.3%	25.0%	16.0%	33.9%
Parkinson's disease	12.6%	13.1%	9.3%	29.5%
<b>Mean (median) days to death from start of study</b>	67.3 (15)	67.3 (15)	81.3 (34.5)	265.1 (365)
Heart failure	64.8 (10.5)	64.8 (10.5)	95.5 (53.5)	247.9 (362)
Respiratory failure	79.4 (27)	79.4 (27)	93.8 (65)	260.1 (365)
End stage renal failure	77.0 (17)	77.0 (17)	85.1 (42)	248.8 (365)
End stage liver disease	40.0 (12.5)	40.0 (12.5)	63.4 (21)	203.7 (186)
Advanced dementia	56.4 (14)	56.4 (14)	97.2 (55)	265.8 (365)
Parkinson's disease	64.9 (12)	64.9 (12)	115.2 (36)	305.1 (365)
<b>Mean age at death</b>	76.9	77.2	72.1	79.9
Below 45	0.4%	0.3%	1.1%	1.2%
45 to 54	3.2%	3.4%	6.7%	2.9%
55 to 64	11.4%	11.6%	17.9%	10.6%
65 to 74	20.9%	20.6%	29.1%	14.4%
75 to 84	36.7%	35.9%	29.9%	24.3%
85 and above	27.4%	28.2%	15.3%	46.6%
<b>Gender</b>				
Male	52.3%	53.5%	61.2%	52.8%
Female	47.7%	46.5%	38.8%	47.2%
<b>Ethnicity</b>				
Chinese	81.4%	80.0%	83.2%	80.3%
Malay	8.2%	8.7%	9.0%	8.6%
Indian	7.9%	8.6%	5.2%	6.7%
Others	2.5%	2.7%	2.6%	4.4%
<b>Low socioeconomic status</b>	58.6%	58.3%	64.6%	41.3%
<b>Mean Charlson Comorbidity Index</b>	9.0	9.1	10.9	8.0
<b>Electronic frailty index</b>				
Fit	10.3%	9.8%	27.2%	18.0%
Mild frailty	20.5%	20.9%	25.4%	27.6%
Moderate frailty	35.9%	35.8%	28.0%	33.0%
Severe frailty	33.3%	33.5%	19.4%	21.4%

## Discussion

Patients with ESOD in this study experienced a reduction in healthcare utilization with palliative care support compared to patients who did not. However, the impact on healthcare utilization was not the same across all the ESOD groups studied. Specifically, patients with advanced dementia, end stage heart and renal disease experienced the greatest reduction in the frequency of all cause ED visits, inpatient hospital admissions and charges. However, end stage respiratory failure patients did not have a reduction in any of the healthcare utilization elements examined, possibly as they were the ESOD group least commonly referred for palliative care although they had the highest frequency of inpatient hospital admissions and ED visits. Timeliness of palliative care referral also affected healthcare utilization in this study. The greatest reduction in healthcare utilization occurred with patients referred at least 1-6 months before death. However, the majority of patients were referred in the last month of life, reflecting a worldwide trend.

## References

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- Saini T, Murtagh FEM, Dupont PJ, McKinnon PM, Hatfield P, Saunders Y. Comparative pilot study of symptoms and quality of life in cancer patients and patients with end stage renal disease. Palliat Med. 2006 ;20(6):631–6.

**Inclusion:** Patients with ESOD, specifically advanced dementia, Parkinson's disease, end stage heart, respiratory, renal and liver failure who accessed palliative inpatient and/or outpatient care in a university affiliated hospital between 2014 and 2017 but died between 2015 and 2017 were included in the study.

**Access to Care:** Defined as the point of initial review by the palliative care team in either the inpatient or outpatient setting.

**Study variables:** Demographic information such as age, gender, ethnicity and socioeconomic status. Clinical variables were of the end stage organ disease (ESOD), comorbidity burden using the Charlson comorbidity index (CCI) and frailty, evaluated using the electronic frailty index (eFI). Primary outcomes of interests were reduction in all-cause emergency department (ED) visits and costs, reduction in all-cause tertiary hospital admissions, length of hospital stay and inpatient hospital costs.

**Analysis:** The reduction in all-cause ED visits and costs, all-cause tertiary hospital admissions, length of hospital stay, and costs were analyzed using paired t-test. Subgroup analyses were performed for each ESOD and for different referral periods (0-13 days before death, 14-30 days before death, 31-90 days before death, 91-180 days before death, 181-365 days before death).

All statistical analyses were performed using Stata version 16.0. CEM was done using Stata module cem, and PSM was done using Stata module PSMATCH2.34. Ethical approval for the study was given by the Institutional Review Board.

Table 2: Reduction<sup>1</sup> due to palliative care for different ESOD

	Heart failure	Respiratory failure	End stage renal failure	End stage liver disease	Advanced dementia	Parkinson's disease
Average no. of ED visits per matched control patient	1.40	1.46	1.01	0.98	1.08	0.91
Average ED gross charges per matched control patient	\$5493	\$5601	\$5349	\$5375	\$5334	\$5277
Average no. of inpatient hospital admissions per matched control patient	1.33	1.59	0.94	0.88	1.01	0.74
Average length of hospital stay (days) per matched control patient	15.0	12.6	9.8	5.5	10.8	8.9
Average inpatient hospital charges per matched control patient	\$517658	\$513591	\$510604	\$56614	\$58288	\$7002
Average reduction in no. of ED visits per patient	<b>0.72</b>	0.21	<b>0.29</b>	0.39	<b>0.44</b>	<b>0.39</b>
(95% CI)	(0.40 – 1.04)	(-0.26 – 0.68)	(0.12 – 0.46)	(-0.01 – 0.78)	(0.25 – 0.64)	(0.04 – 0.74)
Average reduction in ED gross charges per patient	<b>\$5275</b>	\$5158	<b>\$5113</b>	<b>\$5198</b>	<b>\$5137</b>	<b>\$5117</b>
(95% CI)	(\$5154 – \$5396)	(-\$530 – \$5347)	(\$558 – \$5168)	(\$544 – \$5351)	(\$578 – \$5196)	(\$519 – \$5215)
Average reduction in no. of inpatient hospital admissions per patient	<b>0.65</b>	0.31	<b>0.22</b>	0.18	<b>0.37</b>	0.16
(95% CI)	(0.34 – 0.95)	(-0.33 – 0.95)	(0.05 – 0.39)	(-0.11 – 0.47)	(0.20 – 0.55)	(-0.17 – 0.48)
Average reduction in length of hospital stay (days) per patient	<b>6.3</b>	-2.7	<b>2.2</b>	-1.1	<b>2.7</b>	<b>1.6</b>
(95% CI)	(2.4 – 10.3)	(-10.2 – 4.8)	(-0.2 – 4.5)	(-4.9 – 2.6)	(-0.4 – 5.8)	(-4.6 – 7.7)
Average reduction in inpatient hospital charges per patient	<b>\$510877</b>	\$5913	<b>\$55012</b>	\$51258	<b>\$52407</b>	\$51764
(95% CI)	(\$56160 – \$515594)	(-\$5945 – \$57770)	(\$52836 – \$57188)	(-\$51997 – \$54513)	(\$5144 – \$54670)	(-\$52500 – \$56029)

<sup>1</sup>Numbers represent the mean reduction for an individual patient. Numbers in parenthesis represent the 95% confidence interval for the reduction.

<sup>2</sup>Statistically significant results at 5% level are shown in bold

Table 3: Reduction<sup>1</sup> at different referral periods to palliative care for ESOD patients referred to palliative care vs matched controls

	Referred 0 to 13 days before death	Referred 14 to 30 days before death	Referred 31 to 90 days before death	Referred 91 to 180 days before death	Referred 181 to 365 days before death
No. of ESOD patients referred to palliative care	532	138	174	110	98
Average reduction in no. of ED visits per patient	<b>0.22</b>	<b>0.36</b>	<b>0.52</b>	<b>0.85</b>	0.34
(95% CI)	(0.17 – 0.26)	(0.21 – 0.52)	(0.32 – 0.72)	(0.37 – 1.33)	(-0.21 – 0.89)
Average reduction in ED gross charges per patient	<b>\$583</b>	<b>\$5143</b>	<b>\$5201</b>	<b>\$5356</b>	\$5112
(95% CI)	(\$565 – \$5101)	(\$587 – \$5199)	(\$5126 – \$5276)	(\$5171 – \$5541)	(-\$586 – \$5310)
Average reduction in no. of inpatient hospital admissions per patient	<b>0.14</b>	<b>0.33</b>	<b>0.41</b>	<b>0.55</b>	0.39
(95% CI)	(0.10 – 0.18)	(0.19 – 0.46)	(0.20 – 0.62)	(0.10 – 1.00)	(-0.18 – 0.96)
Average reduction in length of hospital stay (days) per patient	<b>0.2</b>	<b>1.7</b>	<b>4.4</b>	<b>3.8</b>	<b>1.9</b>
(95% CI)	(0.0 – 0.4)	(0.4 – 3.1)	(-3.2 – 6.7)	(-3.2 – 10.7)	(-7.3 – 11.2)
Average reduction in inpatient hospital charges per patient	<b>\$5882</b>	<b>\$53965</b>	<b>\$56836</b>	<b>\$59828</b>	\$57949
(95% CI)	(\$5551 – \$51213)	(\$52265 – \$55665)	(\$54632 – \$59039)	(\$52870 – \$516786)	(-\$525 – \$515922)

<sup>1</sup>Numbers represent the mean reduction for individual patient. Numbers in parenthesis represent the 95% confidence interval for the reduction.

<sup>2</sup>Statistically significant results at 5% level are shown in bold.

## Conclusion

One of the first studies to evaluate healthcare utilization between different ESOD, this study shows that palliative care can reduce healthcare utilization, and reduction is greatest when the palliative care referral is timed earlier in the disease trajectory. Cost savings can be judiciously redirected from burdensome interventions in the hospital which neither improve HQQOL nor survival to the development of palliative care resources for integrated support of patients and caregivers