

# **The Singapore end-of-life cohorts assessing health care utilization and cost for seriously ill patients**

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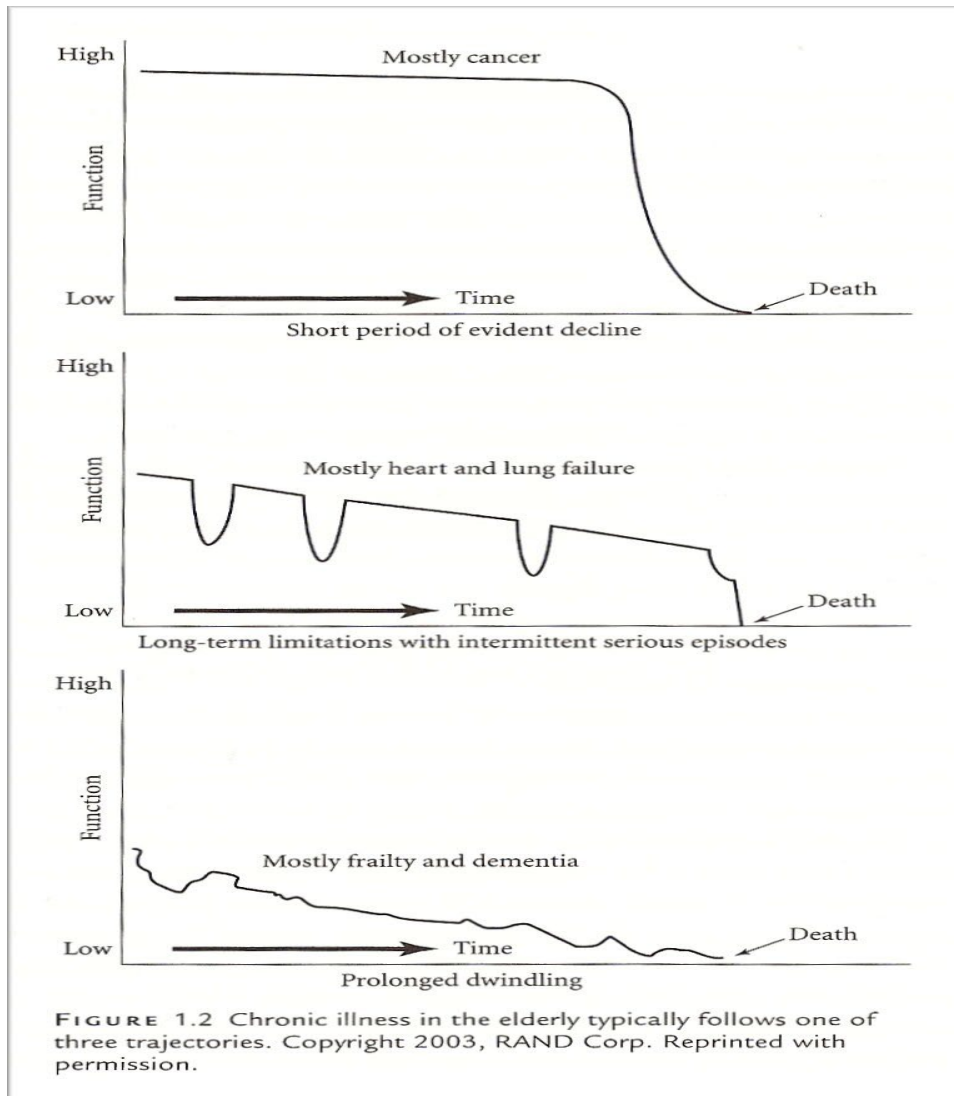
# **Singapore end-of-life cohorts: Motivation**

- Lack of data assessing experiences of patients with advanced serious illnesses and their caregivers
- Existing studies were qualitative, cross-sectional or retrospective analyses of administrative data
- Although insightful, no information available regarding how patient and caregiver experiences changed during last years of patients' life.

# **Singapore end-of-life cohorts: Motivation**

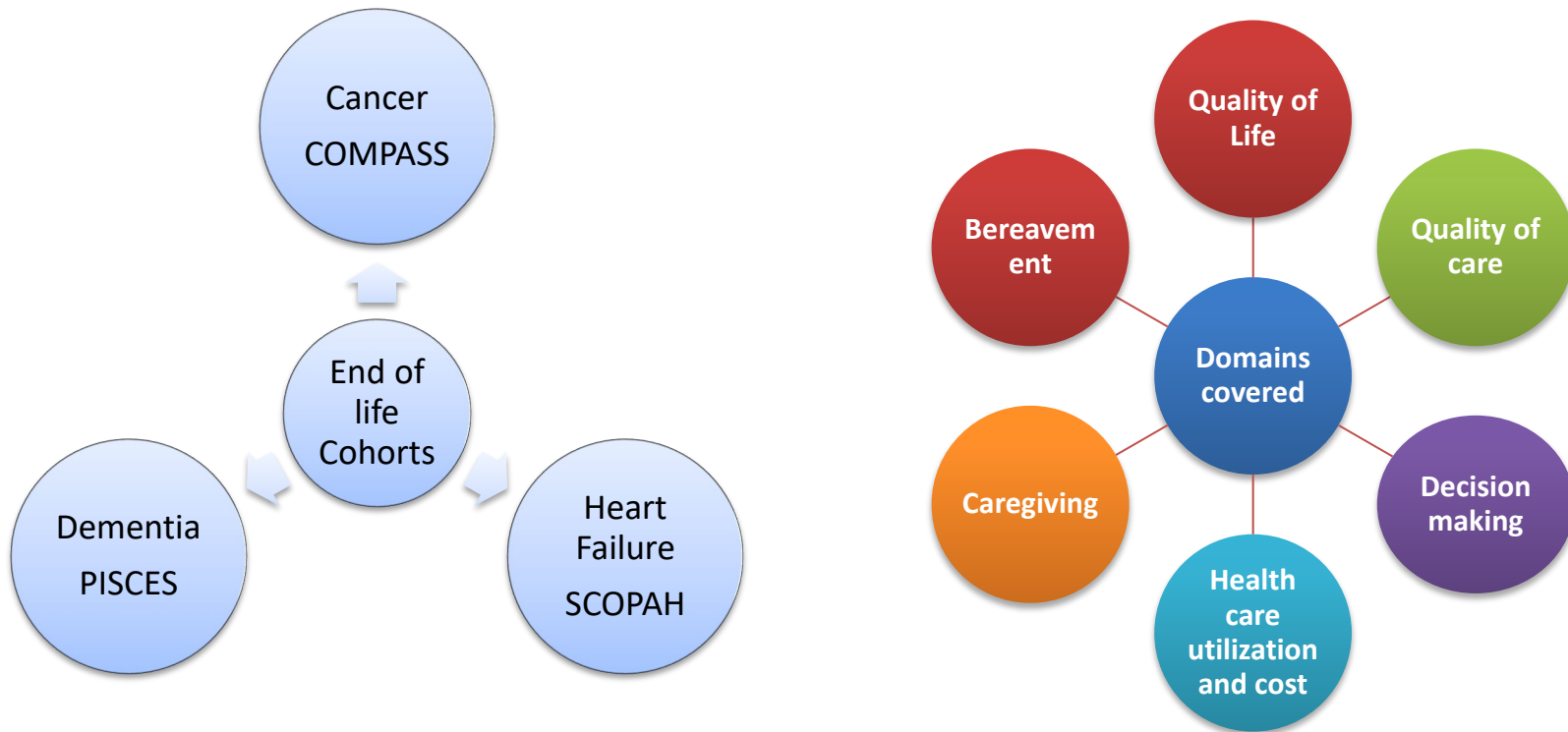
- Longitudinal studies with multiple assessments prior to death and after death needed to assess how patient and caregiver experiences changed during the last years of patient's life, and influenced bereavement

# End of life trajectory differs by illness



- 3 main illness groups:
1. Cancer
  2. Organ Failure – such as heart failure
  3. Dementia

# Singapore end-of-life cohorts target the three main illness groups



**COMPASS:** Costs and Medical Care of Patients with Advanced Serious Illness in Singapore

**SCOPAH:** Singapore Cohort of Patients with Advanced Heart Failure

**PISCES:** Panel study Investigating Status of Cognitively impaired Elderly in Singapore

# Study design: COMPASS

PI: Eric Finkelstein

- 600 solid metastatic cancer patients and their family caregivers
- Sites: NCCS and NUHS
- Followed up every 3 months until death and subsequently 8 weeks and 6 months after
- Multiple sources of data:
  - ✓ Patient surveys
  - ✓ Caregiver surveys
  - ✓ Physician surveys
  - ✓ Medical records
  - ✓ Billing records
  - ✓ Death records
- Funded: Temasek Foundation, LCPC
- Data collection period: 2015 - ongoing

# COMPASS study team

Institution	Investigators
<b>Duke-NUS Medical School</b>	Prof. Eric Finkelstein (PI) Dr. Chetna Malhotra, Dr. Irene Teo, Dr. Semra Ozdemir, Dr. Rahul Malhotra, Dr. Cheung Yin Bun
<b>Cicely Saunders Institute</b>	Dr. Richard Harding
<b>National Cancer Centre Singapore (NCCS)</b>	Dr. Rebecca Dent (Site-PI) Dr. Ravindran Kanesvaran, Dr. Alethea Yee, Dr. Grace Yang, Dr. Patricia Neo
<b>National University Hospital (NUH)</b>	Dr. Nesaretnam Barr Kumarakulasinghe (Site-PI) Dr. Noreen Chan
<b>Singapore General Hospital (SGH)</b>	Dr. Lee Lai Heng (Site-PI)
<b>Dover Park Hospice</b>	Ms. Chin Soh Mun
<b>Assisi Hospice</b>	Dr. Alethea Yee
<b>Methodist Welfare Services Home Hospice</b>	Dr. Andy Lee
<b>Metta Hospice Care</b>	Dr. Tan Tiong Har

# Study design: SCOPAH

PI: Chetna Malhotra

- 250 patients with symptoms of advanced heart failure (NYHA 3 and 4) and their family caregivers
- Sites: NHCS and SGH
- Followed up every 4 months until death and subsequently 8 weeks and 6 months after.
- Multiple sources of data:
  - ✓ Patient surveys
  - ✓ Caregiver surveys
  - ✓ Physician surveys
  - ✓ Medical records
  - ✓ Billing records
  - ✓ Death records
- Funded: MOH-HSRG, LCPC
- Data collection period: Oct 2016- ongoing



# SCOPAH study team

Institution	Investigators
<b>Duke-NUS Medical School</b>	Dr. Chetna Malhotra (PI) Prof. Eric Finkelstein (Co-I), Dr. Irene Teo (Co-I), Dr. Semra Ozdemir (Co-I)
<b>National Heart Centre</b>	Dr Sim Kheng Leng David (Site PI), Dr Yeo Khung Keong (Co-I)
<b>Singapore General Hospital</b>	Dr Aung Than (Site PI)

# Study design: PISCES

PI: Chetna Malhotra

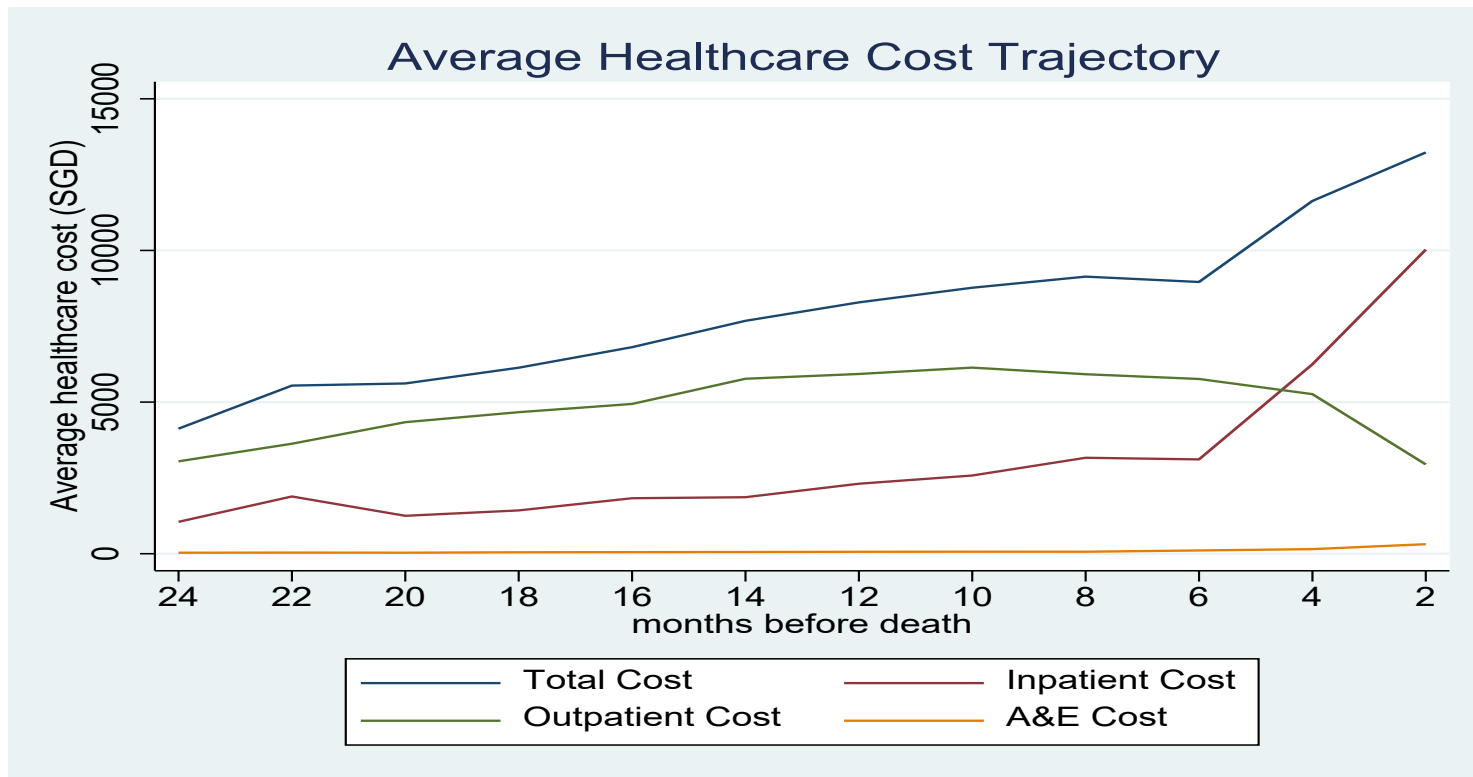
- 215 informal family caregivers of people with severe dementia (FAST 6c and above)
- Sites: SGH, CGH, KTPH, IMH, JCH, St. Luke's Hospital, Care for the Elderly Foundation, Tsao Foundation, Alzheimer's Disease Association, Assisi Hospice
- Followed up every 4 months until death and subsequently 8 weeks and 6 months after.
- Multiple sources of data:
  - ✓ Caregiver surveys
  - ✓ Physician surveys
  - ✓ Medical records
  - ✓ Billing records
  - ✓ Death records
- Funded: MOH- HSRG, LCPC
- Data collection period: April 2018 - ongoing

# PISCES Study team

Institution	Investigators/Collaborators
<b>Duke-NUS Medical School</b>	Dr. Chetna Malhotra (PI), Prof. Eric Finkelstein, Dr. John Allen, Prof. Truls Ostbye , Prof. Rahul Malhotra
<b>Singapore General Hospital</b>	Dr. Dennis Seow (Site-PI)
<b>Changi General Hospital</b>	Dr. Tan Lay Ling (Site-PI), Dr. Ng Li Ling
<b>Khoo Teck Puat Hospital</b>	Dr. Philip Yap (Site-PI)
<b>Institute of Mental Health</b>	Ms. Janhavi Vaingankar (Site-PI), Dr. Richard Goveas
<b>Jurong Community Hospital</b>	Dr. Tong Ka-mun (Site-PI)
<b>St. Luke's Hospital</b>	Dr. Tan Boon Yeow (Site-PI)
<b>Care for the Elderly Foundation</b>	Dr. Tham Weng Yew (Site-PI)
<b>Agency for Integrated Care</b>	Dr. Tan Weng Mooi, Ms. Luo Danlin
<b>Geriatric Education &amp; Research Institute</b>	Dr. Wee Shiou Liang
<b>Alzheimer's Disease Association</b>	Mr. Jason Foo (Site-PI)
<b>Tsao Foundation</b>	Dr Ng Wai Chong (Site-PI)
<b>Dover Park Hospice</b>	Dr Allyn Hum (Site-PI)

**HEALTH CARE USE AMONG  
PATIENTS WITH A SOLID  
METASTATIC CANCER**

# Health care cost increases during last months of life and is driven by inpatient costs



Balasubramanian I, Finkelstein E, Malhotra R, Ozdemir S, Malhotra C. Healthcare cost trajectories in the last two years of life among patients with a solid metastatic cancer: A prospective cohort study. JNCCN - Journal of the National Comprehensive Cancer Network (forthcoming).

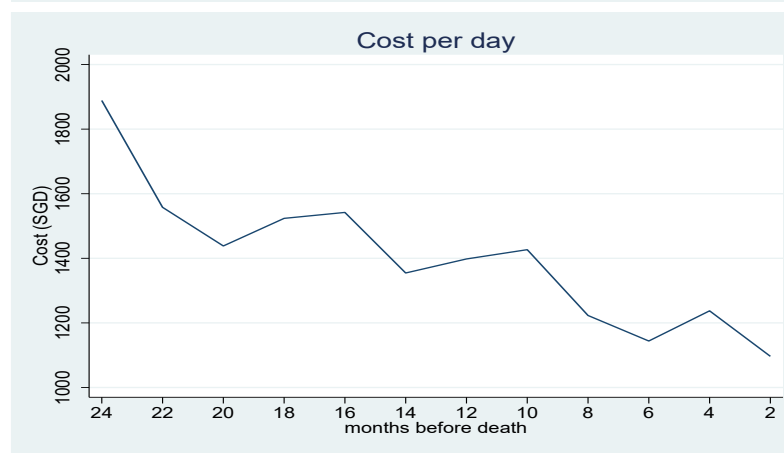
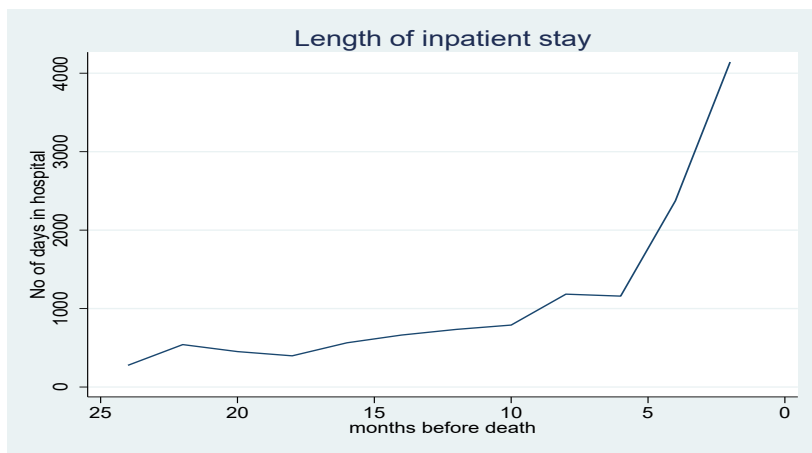
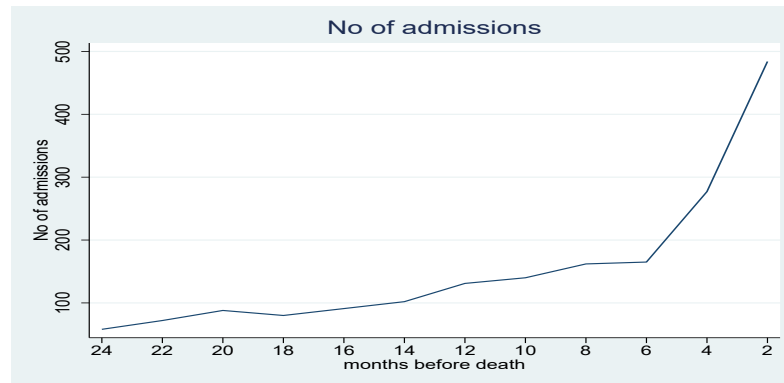
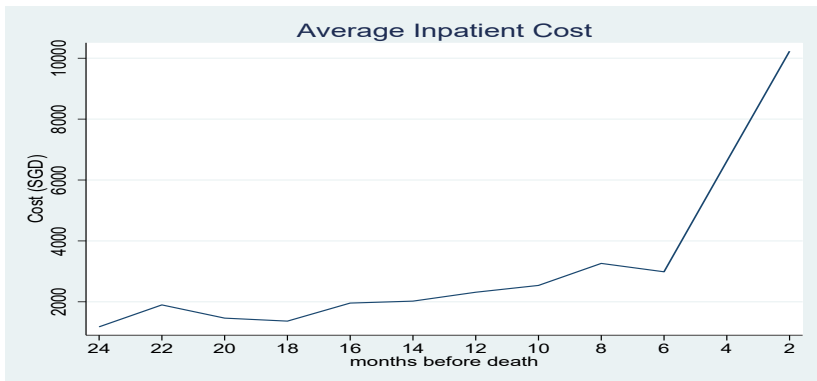
# EOL care costs (in SGD): Cancer

	Mean Total Healthcare Cost	Mean Total Outpatient Cost	Mean Total Inpatient Cost
Last 2 years of life	95931	58342	36744
Last 1 year of life	60021	31954	27436
Last 6 months of life	33826	13970	19385
Last one month of life	7516	1140	6202

# Why is inpatient cost increasing in last months of life?

- Is it because of use of aggressive life prolonging treatments?
- Or is it because we are spending more money managing very sick patients?

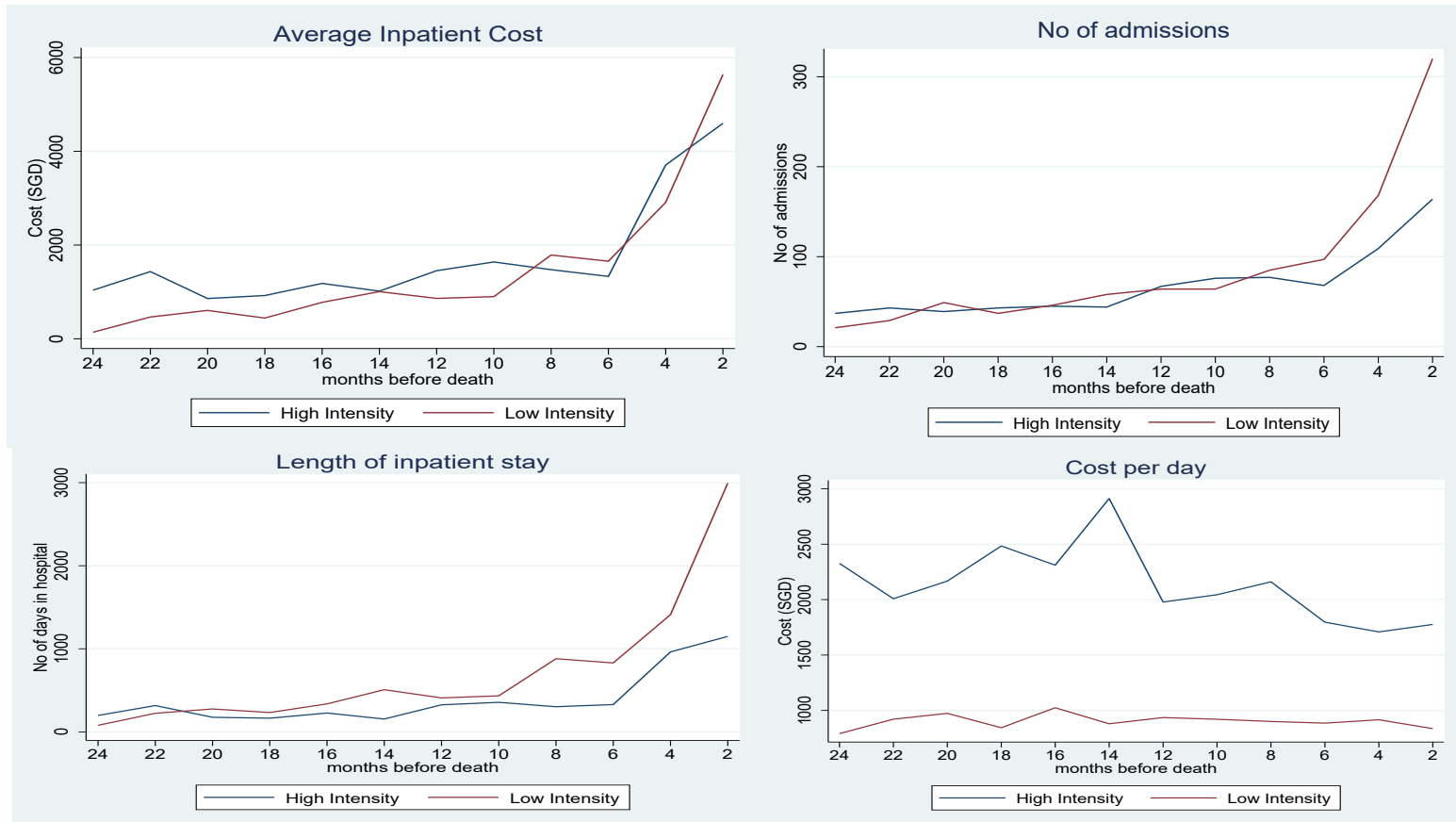
# Opening the 'black box' of inpatient costs



- Inpatient cost increases steeply closer to death
- Cost seems to be driven by the number of admissions and days spent in hospital
- Cost per day decreases closer to death



# Opening the 'black box' of inpatient costs



- The no of days spent in low intensity admissions is much higher than that in high intensity admissions
- Despite the low cost of low intensity admissions (by definition), the cost of low-intensity admissions surpass that of high intensity admissions in the last 2 months before death
- Cost per day of high intensity admissions decreases closer to death

# Cost of treatment components as percentage of total inpatient cost

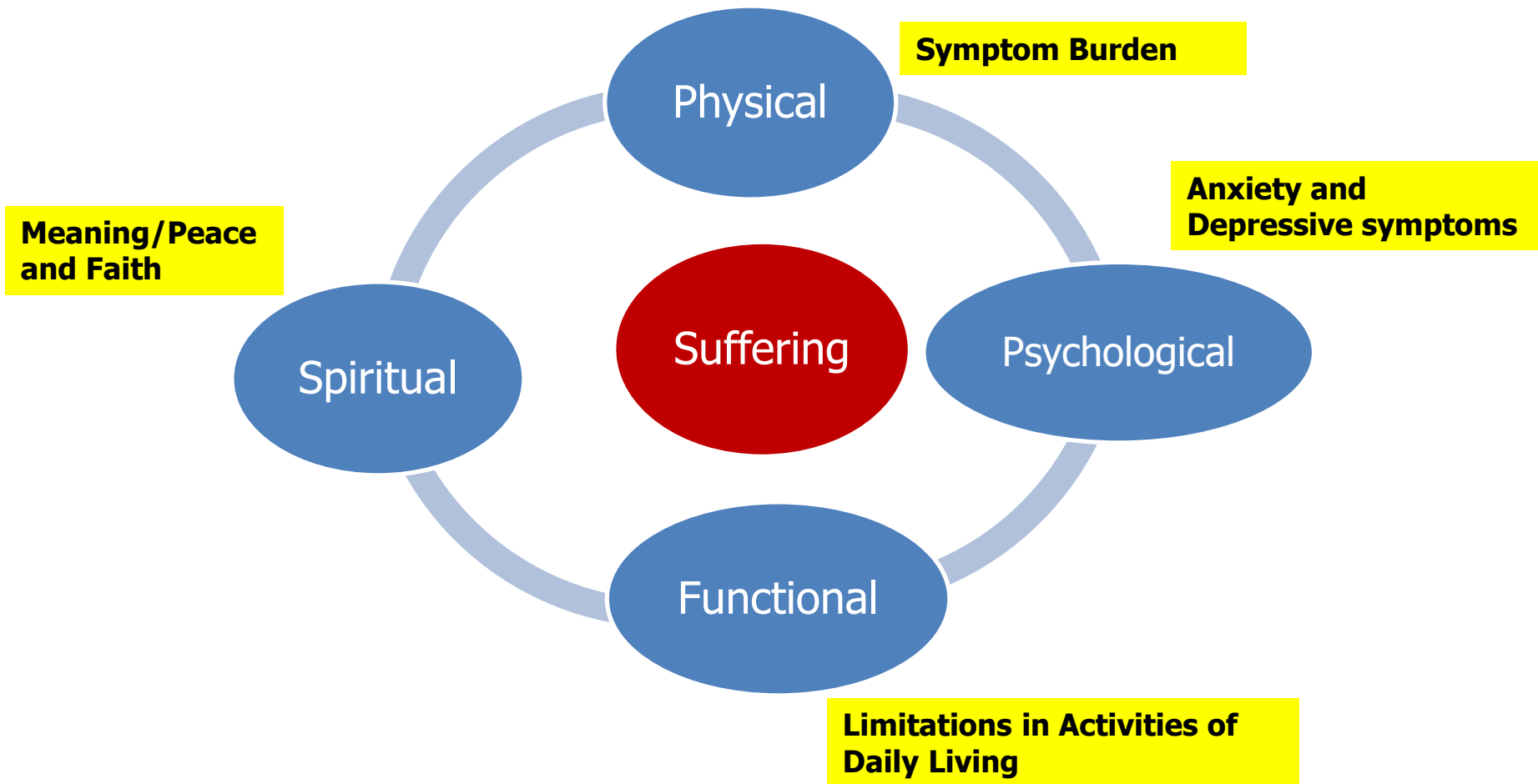
	Ward	Lab/X-Ray	Surgery	Evaluation & Maintenance	ICU/CCU/ ICA/HD ward	Procedures	Consumables	Drugs	Other
All Admissions									
0-2 mbd	33.8	23.7	5.7	10.9	3.2	1.9	7.2	7.5	6.0
0-6 mbd	31.8	24.7	6.9	9.0	4.4	2.0	6.8	8.1	6.3
6-12 mbd	28.0	25.5	13.1	5.3	2.4	1.9	8.6	8.4	6.9
12-24 mbd	23.5	26.6	18.2	4.2	4.0	1.4	9.3	6.9	5.9
Low-Intensity Admissions									
0-2 mbd	45.9	20.5	2.1	11.3	0.2	1.9	6.5	5.6	6.1
0-6 mbd	43.2	22.5	2.8	9.6	1.8	2.1	5.6	6.0	6.3
6-12 mbd	41.9	25.6	4.4	6.2	1.2	2.1	5.0	8.3	5.4
12-24 mbd	39.1	28.2	5.5	5.9	1.2	2.1	4.0	6.5	7.4
High-Intensity Admissions									
0-2 mbd	19.1	27.6	10.1	10.4	6.9	1.9	8.1	9.9	6.0
0-6 mbd	19.7	27.0	11.2	8.4	7.2	1.9	8.0	10.3	6.4
6-12 mbd	17.2	25.4	20.0	4.5	3.3	1.7	11.4	8.4	8.0
12-24 mbd	14.6	25.7	26.1	3.2	5.4	0.4	12.2	6.9	5.6

Abbreviation: mbd – months before death

1. Ward costs include cost of stay in normal ward (Class A1,B1,B2,C) and daily treatment fee.
2. Surgery costs include surgeon fee, anaesthetician fee, facility fee and cost of implants.
3. Lab costs include cost of laboratory investigations, x-ray, scan, MRI and special investigations
4. Evaluation and maintenance costs include doctor fee for consultations, counselling fee, speech therapy, feeding, pain management, physiotherapy, occupational therapy, nutrition therapy etc
5. Procedure costs includes procedures such as inpatient chemotherapy, radiotherapy, dialysis and some invasive procedures
6. Other costs include costs of routine ward procedures such as dressing, non-treatment and miscellaneous costs

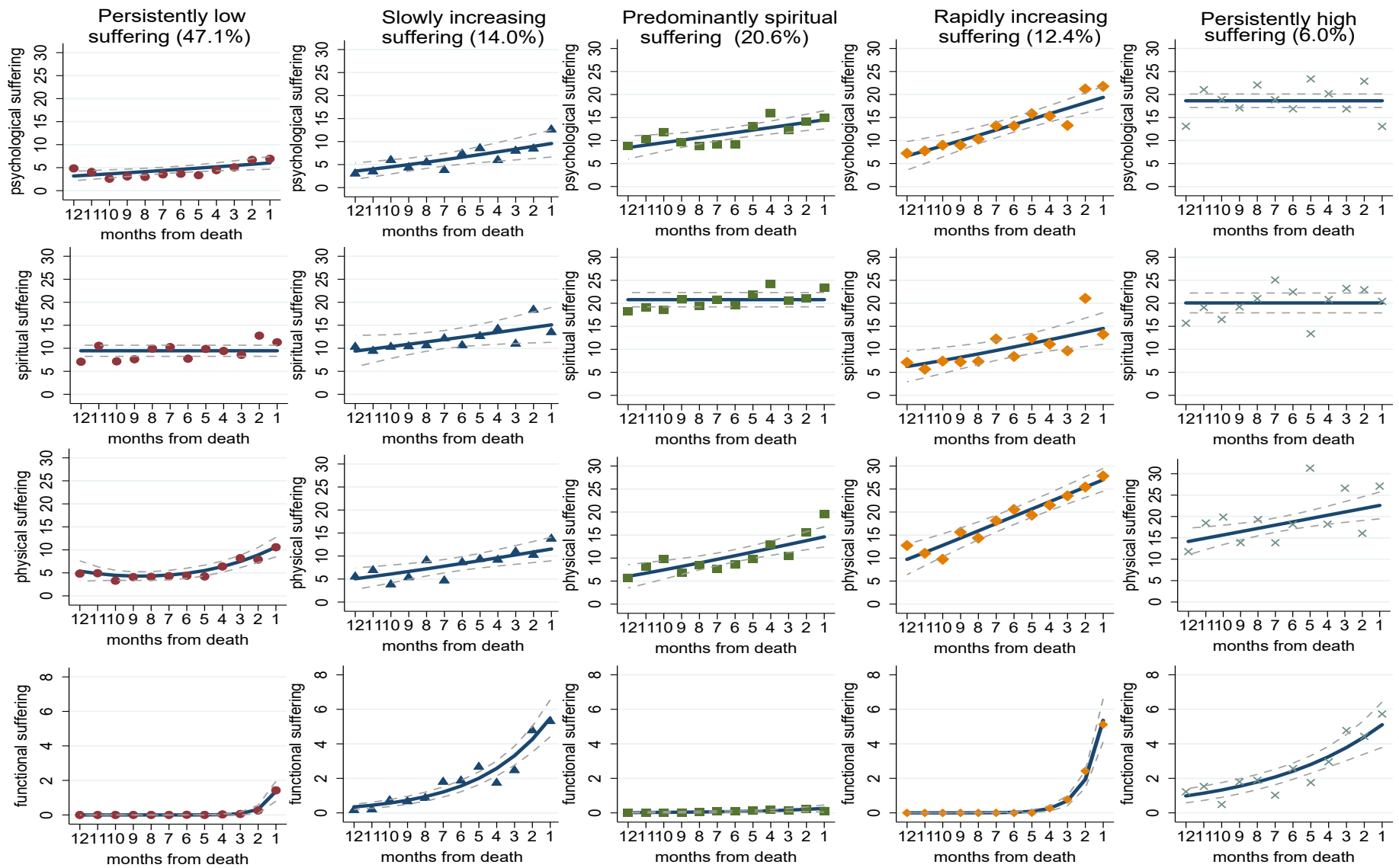
- Although surgery and ICU costs are high, inpatient costs during the last months of life are driven by low-intensity admissions involving 'maintenance care', and 'ward stay'.
- Patients with poor health more likely to experience 'low-intensity' admissions.
- Potential to reduce these costs by shifting them to an alternate place of care like hospice

# Patient suffering in the last year of life is high

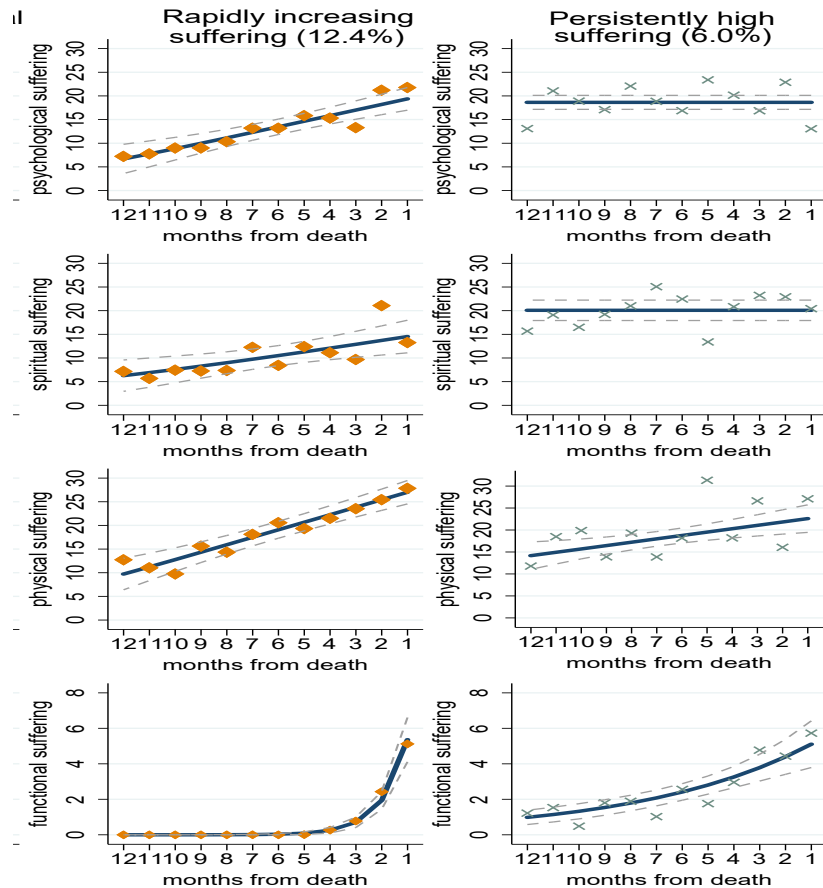


Malhotra C, Malhotra R, Bundoc F, Teo I, Ozdemir S, Chan N, Finkelstein E. Trajectories of suffering in the last year of life among patients with a solid metastatic cancer. JNCCN—Journal of the National Comprehensive Cancer Network. 2021; 19(11), 1264-1271

# Psychological, spiritual, physical and functional suffering varies during last year of life (N=345 decedents)



# Patients with very high suffering: 18% of sample



Compared to persistently low suffering group, they had

**more:**

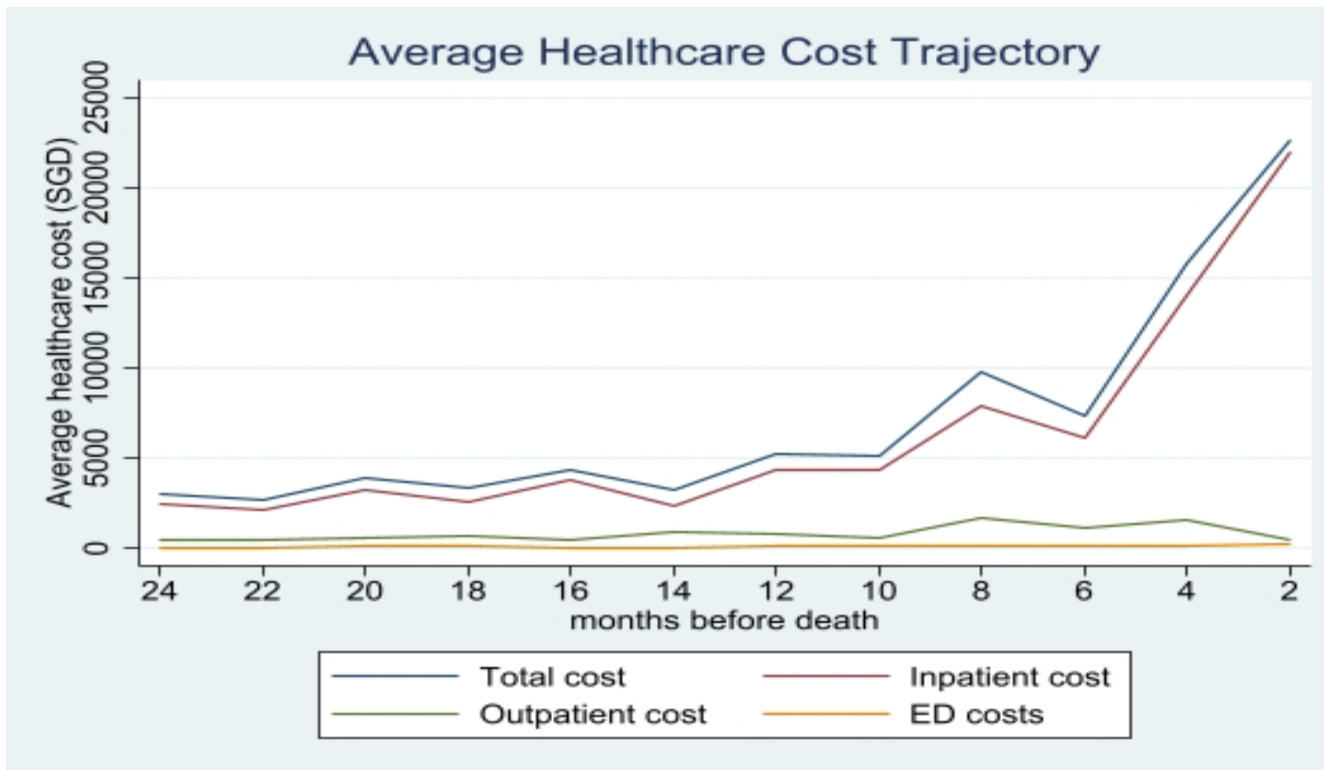
- Hospital admissions in last year of life
- Hospital days in last year of life
- Likely to die in hospice

# Summary

- Health care costs for patients with a solid metastatic cancer are high and increase in last months of life driven primarily by inpatient costs
- Inpatient costs during the last few months are driven by increase in 'maintenance costs' for patients rather than aggressive interventions
- Patients who experience high suffering use most health care resources
- Potential to reduce inpatient costs by shifting place of care to an alternate place like hospice

# **HEALTH CARE USE OF PATIENTS WITH HEART FAILURE**

# Health care costs (n=107 deceased patients)



Average total health care cost in the last year of life is SGD 65850

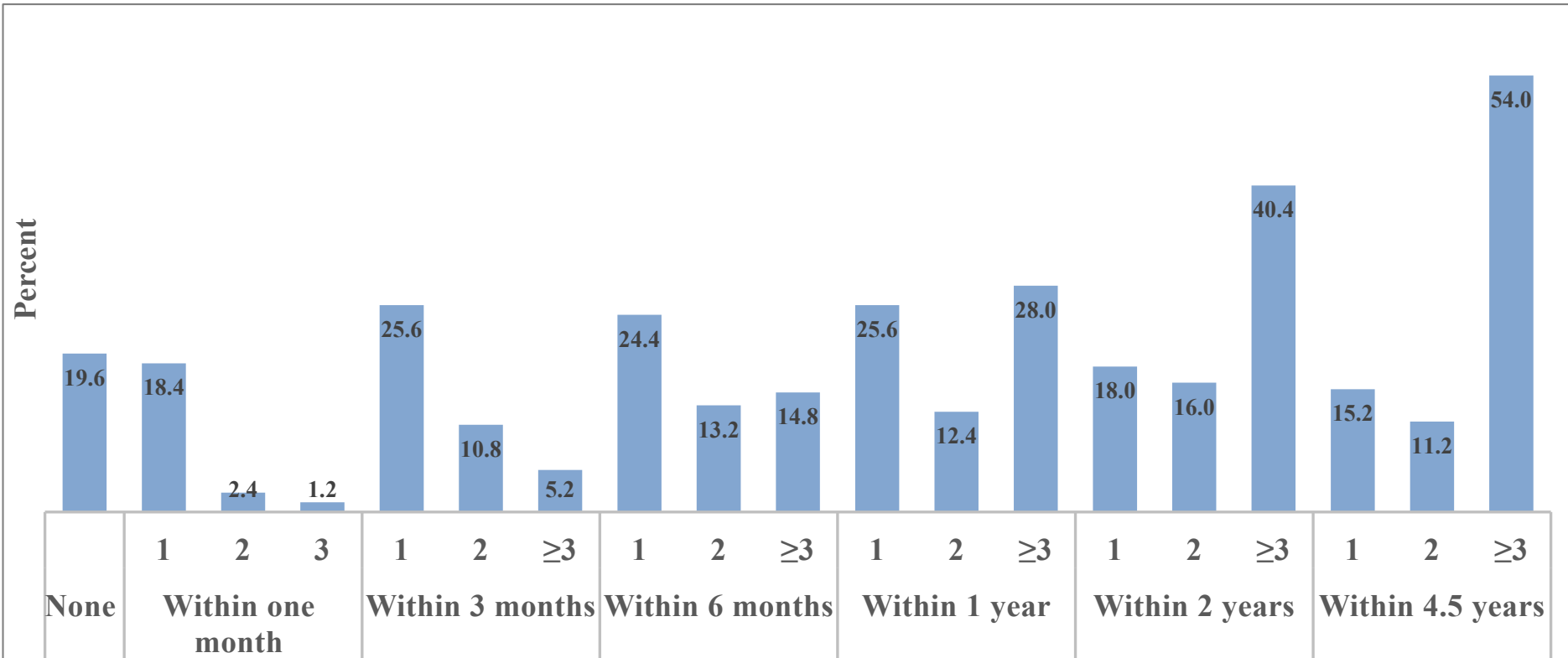
Average monthly cost in the last year is SGD 5487

Average monthly cost in last month is SGD 11323

Total health care costs in last year of life are driven by inpatient costs



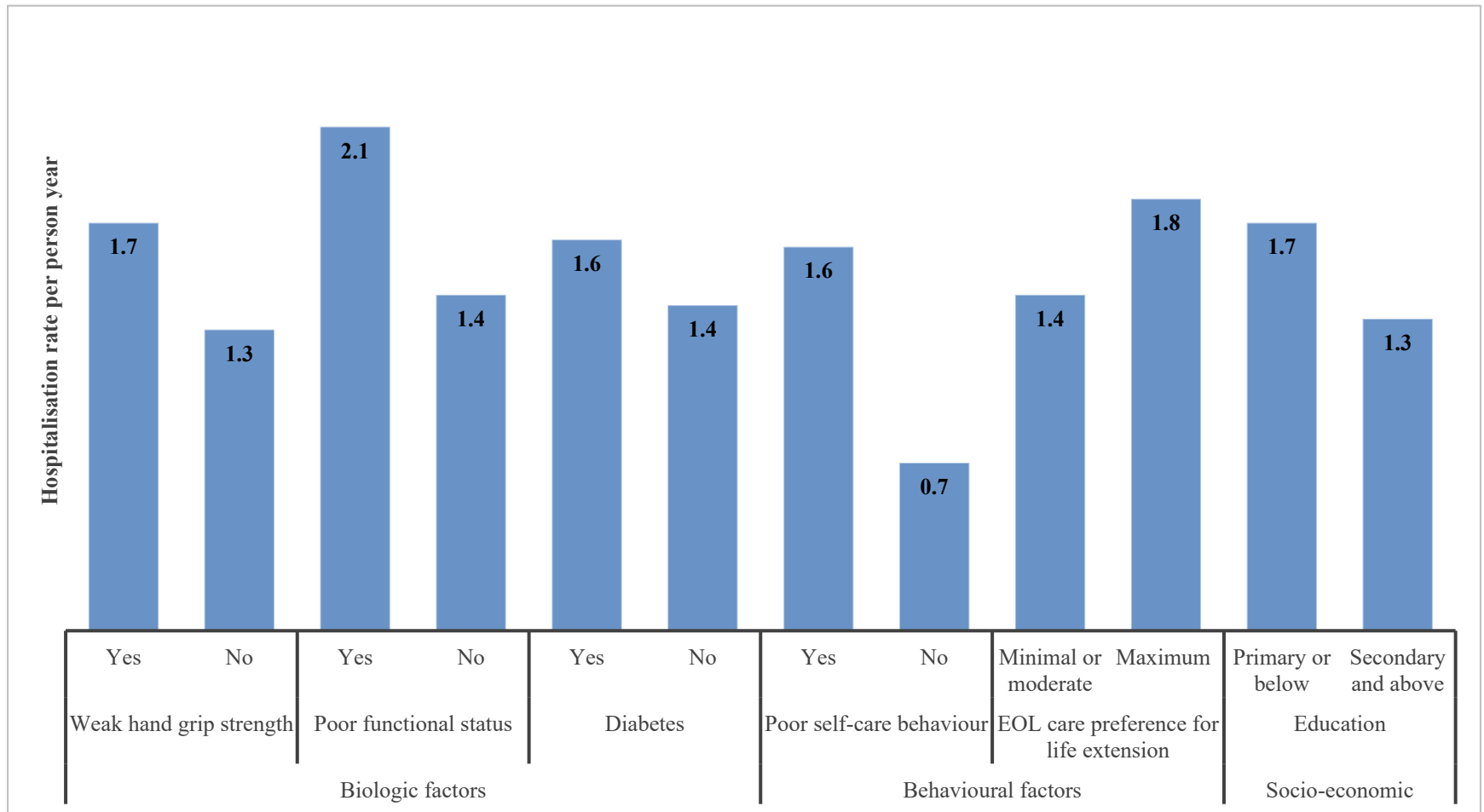
# Heart failure: recurrent hospital admissions



Within one month, six months, one year and two years of the index hospital admission, 22%, 53%, 66% and 74% of the patients had at least one readmission

\*raw data; does not take into account different follow-up periods and mortality

# Risk factors for recurrent admissions



Re-admission rate ↑ 26%

33%

15%

55%

21%

23%

# Summary

- Patients with heart failure experience recurrent hospital admissions
- Most risk factors for these admissions, e.g. poor self-care behaviors are modifiable/reversible through appropriate social care interventions
- Potential to reduce economic burden of heart failure

# **COST OF CARING FOR A PERSON WITH SEVERE DEMENTIA**

# Dementia Informal Caregiving Cost

Most persons with dementia are cared for in the community by their informal family caregivers. We quantify the hours and cost of this informal caregiving

Mean informal care (hours/month)	
Total mean hours/month for ADLs and IADLs	108 hours/month
Total mean hours/month for ADLs, IADLs and Supervision	189 hours/month
Total annual cost of informal care for ADLs and IADLS (50th percentile)	SGD 12,032
Total annual cost of informal care for ADLs, IADLs and supervision (50th percentile)	SGD 21,153

Cost of informal care was calculated using the 'proxy good' or the 'replacement cost' method, that values caregiving time at the labor market price of a close substitute. We multiplied the 2019 gross hourly income of a health care assistant or a personal care worker in Singapore (SGD 9.30 per hour) with average hours of caregiving per day to calculate the informal caregiving costs.

# Having a domestic helper reduces informal caregiving cost

- For combined ADL and IADL:
  - Caregivers with helper: SGD 9471 annually
  - Caregivers without helpers: SGD 22024 annually
- For combined ADL, IADL and supervision:
  - Caregivers with helper: SGD 18007 annually
  - Caregivers without helpers: SGD 33427 annually

# Caregivers' absenteeism

(n=119 employed caregivers)

- 79% of the caregivers experienced absenteeism due to caregiving at least once during one year
- On average, in a month, caregivers experienced 2.3 (SD 5.9) absenteeism days and SGD 758 (SD 2120) absenteeism cost.
  - For high functional impairment (in person with dementia): additional 2.5 absenteeism days and SGD 788 absenteeism cost for caregivers
  - Health shock (in person with dementia)- additional 1.8 absenteeism days and SGD 772 absenteeism cost for caregivers
- Caregivers with adaptive coping styles less likely to experience absenteeism in presence of health shock in person with dementia

# Summary

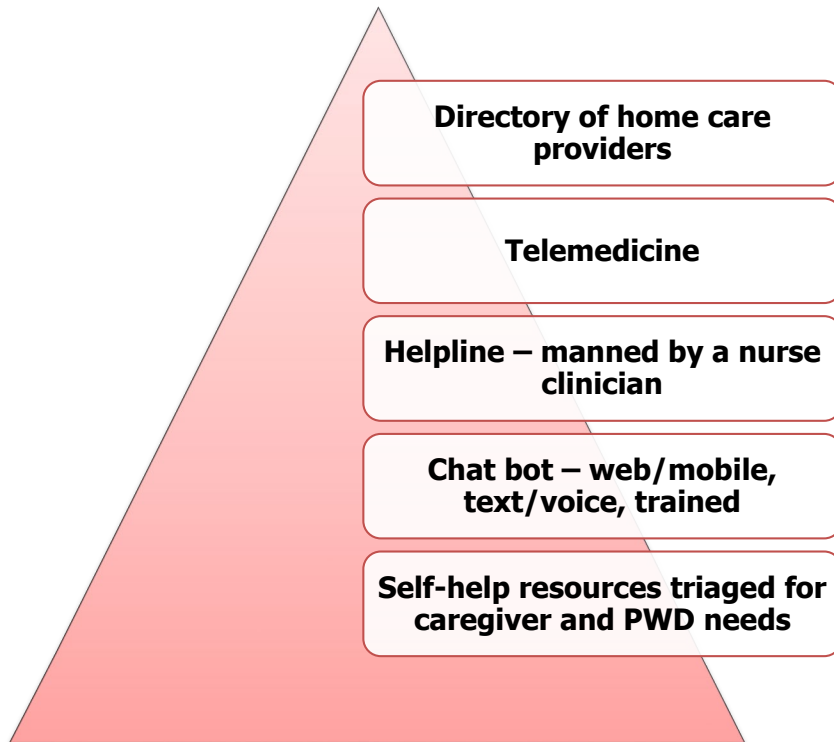
- Informal caregiving for persons with severe dementia is a highly time-consuming activity
- Employed caregivers of persons with severe dementia experience substantial absenteeism days and cost
- How can we support these caregivers better?



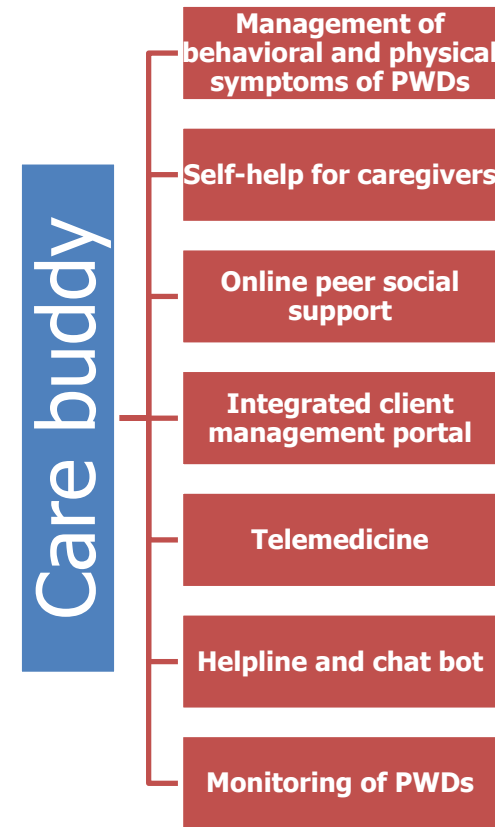
# The 'Care buddy' intervention

(Creating a web-based caregiving ecosystem to support caregivers of people with dementia)

## Tiered response within a single digital platform



- Continuous support
- Responsive to ad-hoc needs



Funded by: National Innovation Challenge (NIC) on Active and Confident Ageing 2022

**Thank You**

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