

# [AL1] A more productive way of monitoring waste excretion in bed-bound patients

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# Problem statement / Title

*“A more productive way of monitoring patient waste excretion and managing incontinence”*

## Description of problem

1. 47% of Singapore total population will be aged 65 years or older in 2050.  
*(Source: United Nation report,2019)*
2. 57% of TTSH patient population aged >65 years or older.  
*(Source: Nursing Trendcare report ,2018)*
3. 54 % of TTSH patient population were on diapers *(Source: Point Prevalence audit Jul, 2018)*
  - Incontinence- unable to hold urine
  - Pain, unable to ambulate to toilet and refused to use bed pan
  - Immobile (e.g. Traction/ on devices)
  - Not comfortable with bed pan
  - Critically ill
  - Noturia (Night usage only)
  - On Therapeutic interventions
  - Contraindicate for indwelling urinary catheter



# Problem statement / Title

*“A more productive way of monitoring patient waste excretion and managing incontinence”*

## Pain points

Each activity takes up 5-7 mins (1-2 nurses) per diaper change with a daily of 7-8 times regardless of the extensive of the soiled. Impact:

### Nurses & Care Providers

- Back straining and pain due to repetitive and laborious effort. Supportive device (e.g. back support belt) not helpful.
- Equipment innovations (Turning device, electrical bed) address the routine turning but not managing incontinence & diaper change.
- Repetitive activity take up much of nursing hours
- Extra processes if output required to be monitored.

### Patients

- Disrupted sleeping patterns, risk of fall at night.
- Noise and light disturbance to other patients
- Daily change of diapers, increase healthcare costs
- Increase risk of contact from health care professional- Increase risk of infection – increase non compliance of hand hygiene
- Frailty with pathological fracture, risk of developing pressure ulcers

### Global Warming

- Diapers do not degrade well in a landfill. What's more, disposable diapers take about 500 years to decompose.

## Scale of problem / Impact of solution

1. Beyond TTSH/ Acute Hospital innovations.
2. Depleting nursing workforce & Operative workforce
3. Improve hospital acquired infection rate with less direct contact from health care professional
4. Opportunities to wean off diapers/ continence state.
5. Manpower saving is substantial
  - Saving 1 diaper changing activities – 5 mins x 500 patients x 365 days with 2 staff carrying out this activity = 15.6 FTE.
6. Environmentally Friendly

## What you need from external partners

- Develop a product to hold the urine longer.
- Able to determine the amount, color and odor of the urine contain in the product, interface results into Electronic medical system
- Chemical effect to change urine into skin agent to sooth skin condition to prevent pressure ulcer
- Monitor trending of urine output to allow retraining of bladder to revert to incontinence state

# [AL2] An affordable solution for transfer of wheelchair-bound patients

By Shirley Yip



Confidential

## Problem statement / Title

# An affordable solution for transfer of wheelchair-bound patients

### Description of problem



1. This is a standard Tan Tock Seng Hospital chromed, steel, foldable frame wheelchair. It has fixed arms and footrests. On its own, its simple structure is stable and useful. However, these wheelchairs are not user-friendly.
2. These wheelchairs are cumbersome. They have sharp, pointy, angular metal edges.
3. The arm and footrests cannot be folded down.
4. Significant number of the wheelchairs at TTSH have faulty brakes (damage, poor maintenance etc.).
5. There are no instructions on the wheelchairs or at the pick-up/drop off locations on how to use their features.
6. Existing wheelchairs are non intuitive to use without training of of users/handlers.

## Problem statement / Title

# An affordable solution for transfer of wheelchair-bound patients

### Pain points

1. Fixed armrests are not collapsible. Causing below problems:-
  - a) Patient's bottom prone to banging against the armrest while getting into the car. Patient must be lifted over armrest to enter the wheelchair
  - b) Caregiver/helper often has insufficient strength to lift patient into the car from wheelchair (or from car into wheelchair), risking either her spraining her back or other injury, or patient banging his head on car door/roof.
2. Fixed footrests are not collapsible. Causing below problems:-
  - a) Patient's legs prone to hitting against the sharp, metal fixture while getting into or out of car.
  - b) Patient tripped, risk of falls.
3. There are no instructions on how to use the features on a wheelchair. This cause below problems:-
  - a) Moving off when brakes are "on". Overtime, brakes become faulty.
  - b) Helpers, relatives or taxi drivers have little experience handling wheelchairs or rendering assistance to lift the patient in/out of car.

### Scale of problem / Impact of solution

1. In TTSH alone, we have about 100 wheelchairs.
2. Other places using similar model wheelchairs are:-
  - Major public hospitals in Singapore:- NUH, Alexandra, NTFH, SGH, KTPH, KKH, CGH etc. have similar numbers.
  - 26 Polyclinics have about 3-4 wheelchairs each.
  - Major Hotels have about 1-2 wheelchairs each.
  - Private medical facilities e.g. Novena Medical, Thomson Medical, Mt. Elizabeth etc. have similar numbers to public health facilities.
  - About 50 nursing homes having 1-2 wheelchairs each.
3. Stakeholders are Caregivers, patient, helpers, doctors, nurses, medical professionals, patients, concierge etc.

### What you need from external partners

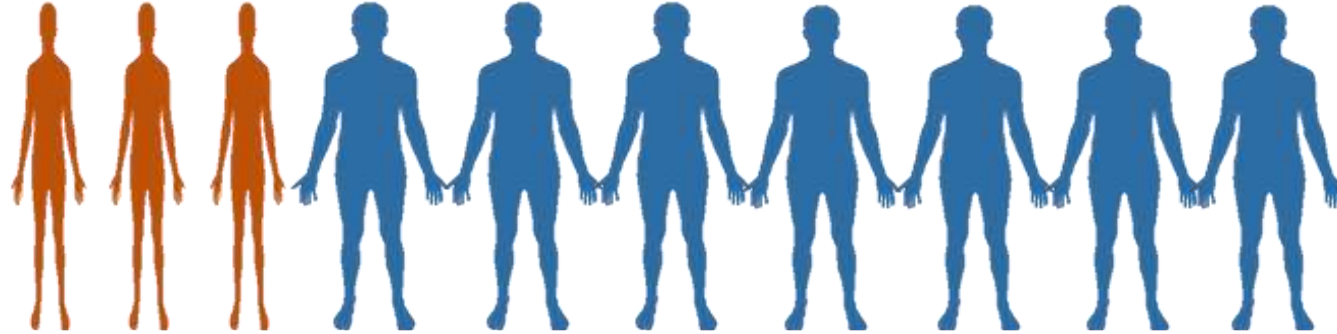
- a) Company that can modify the existing wheelchair design, including intuitive operating guide.
- b) Trainer to educate public on the use of these wheelchairs.

[AL3] Food for elderly that provides the right balance of nutrition, is delectable, and easy to prepare

By Ong Fangyi (Snr Dietician, TTSH)

## Malnutrition in Singapore

Lim et al. (2012)





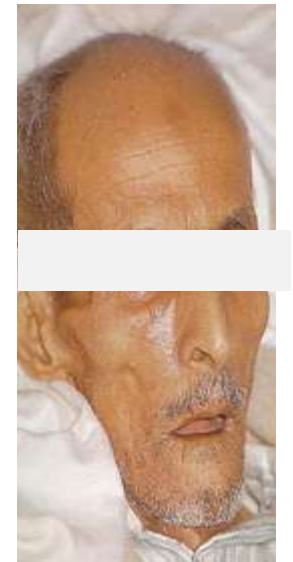
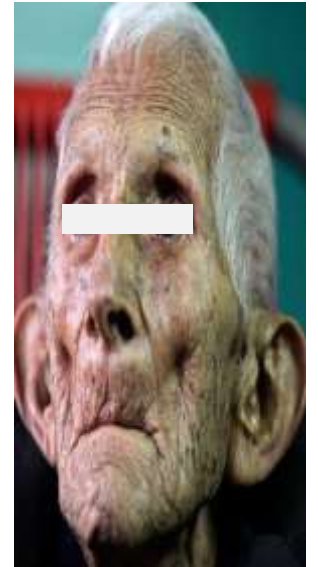
### 1) Well nourished/ at risk



### 2) Mild-moderate malnutrition



### 3) Severe malnutrition



1. Often, dairy based oral nutrition supplements are prescribed. Varying effectiveness will be observed as the anorexia of aging may be multifactorial and there is also varying acceptance of these "milk shakes".
2. Common issues raised by caregivers or patients
  - lack of alternative nutritious options that are easy to prepare,
  - fatigue or physical limitations that
  - dislike of "milk shakes"
  - dentition issues
  - lack of softer textures,
  - lack of higher protein and calorie options as they may not be able to accept larger volumes of food.
  - Many of these coincide with literature that report features that increase risk of eating or swallowing problems in older people (Cichero, 2018)

# Problem statement / Title

*“Food for elderly that provides the right balance of nutrition, is delectable, and easy to prepare”*

Product	Serving size	Kcal/serve	Protein (g)/ serve	CHO (g)/ serve	Fibre (g)/ serve	Na (mg) / serve	Key Ingredients	Any special features	Made in?	Cost/ package
Knorr Cup porridge_Chicken & Corn Flavour	35g (per cup)	120	2.9	26.1	NA	740	Instant rice flakes, Salt, Corn, MSG, Hydrolysed Vegetable Protein, Sugar, Pumpkin, Maltodextrin, Onion, Chicken fat, Palm fat, Permitted flavouring, Soy Sauce, Sodium Inosinate and Guanylate, Beta Carotene, Spices, Spring Onion, Vitamins, Palm Olein	Paper cup form, to prepare, add 250ml hot water for 2 min	Unilever; made in Msia	\$1.60
Maggi Fish Flavour Rice Porridge	63g (per sachet- 2 serves per sachet)	115	3.4	24.7	0.3	557	Rice, Starch (contains sulphites), MSG, Textured Soya Protein, Flavourings, Salt, Maltodextrin, Potassium Chloride, Ginger, Fish, Palm Oil, Leek, White Pepper, Fish Oil, Sugar, Sodium Inosinate, Sodium Guanylate, Sodium Ascorbate, Tocopherols, Emulsifier	Needs cooking- pour into bowl, add 250ml per serve and boil at low heat for 10min; or microwave in bowl for 10min	Nestle, Msia	\$1.70
Pumpkin Porridge with Honey	285g (per small plastic bowl)	210	3	49	0	440	Pumpkin, Autumn Squash, Refined water, Refined sugar, Red Bean, Glutinous Rice Flour, Glutinous Rice, Honey, Vitamin C, Refined Salt	No clear instructions	Dongwon; Korea	\$3.45
JP Clasuwa Herbal Porridge Green	20.4g (per sachet)	78	2.9	14.8	0.8	465	Polished Rice, Soy milk, Spinach, Green Pepper, Extract (Chicken, Vegetables, Yeast), Dry Salmon, Green Rice, Mung Bean, Spinach Paste, Starch, Salt, Protein Hydrolysate, Garlic Powder, Black Pepper, Trehalose, Antioxidant (Vit E), Sweetener (Stevia)	Add 140ml hot water together with sachet into a bowl	Japan	\$4.50
Instant Jasmine Rice Porridge with Salmon, Seaweed	50g (per sachet)	190	4	42	1	540	Jasmine rice flakes, Seasoning, Salmon Extract powder, Dried Vegetables, Seaweed, Vitamin Complex (INS 307b, INS 551), Food Additive (Maltodextrin, INS 307b, INS 551)	No added MSG, Pour 250ml hot water (>85 degrees) over it in a bowl, and let stand for 1 min.	Namchow, Thailand	\$1.85

Low  
calorie

Low  
protein

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Ingredients  
& Texture

Preparation  
methods

[AL4] A way to prevent elderly from injury if they fall from their beds

By A/Prof Thomas Lew, Sr Consultant, TTSH

# Preventing Elderly Falls in Hospitals

- Most systems available today prevent a serious fall from taking place through a series of advanced sensor systems and alerts that permit human intervention before a person falls from bed and suffers serious injuries.
- The focus is on predicting the fall before it occurs and to intervene.

# What if we re-state the Problem?

- What about guaranteeing an injury free fall, even if it should occur?
- What conditions need to be considered?
  - Tropicalisation (cannot be hot and uncomfortable); solution must be safe when deployed (cannot suffocate the person); ubiquity (deployable at home in hdb flat and standard?); flexible (can still go to toilet with it?)
- Should it hug or be distant from the person?
- Can it even be used round the clock?

<https://www.springfreetrampoline.com/blog/2018/03/21/flexible-enclosure-thats-3x-stronger-steel>

<https://www.d3o.com/>

<https://hovding.com/video/>



## Characteristics of Falls & #s

- Falling from bed because of confusion / dementia
- Needing to pee in the middle of the night
- Beds-sides are raised due to preventive bed-rails
- Older patients – osteoporosis (reduced density; calcium in bones)
- 7% of all hip # are in-hospital (Denmark study, 2005)





# [AL5] Effective and affordable utensils for patients with swallowing difficulties

By Ms. Angeline Tan  
Principal Speech Therapist, KTPH

#### **Description of problem**

1. In the acute hospital setting and the current market, there is a lack of affordable and suitable utensils for adult patients with swallowing problems.
2. Specifically, these patients may have:
  1. Difficulty opening their mouth,
  2. Difficulty achieving lip seal during drinking,
  3. Poor control of fluids in their mouth,
  4. Less than ideal feeding positions
  5. Impulsive feeding behaviour
3. These difficulties may be caused by medical conditions such as stroke and head and neck cancers. Patients may need to lie supine due to spinal cord injury and other operations, and therefore unable to sit upright for eating and drinking. Additionally, patients with psychological disorders or intellectual disabilities often exhibit impulsive feeding behaviour, and would also benefit from the use of specialised utensils.
4. Currently, speech therapists make recommendations regarding mode of feeding and size of bolus to facilitate feeding for such patients. Speech therapists may recommend trying children's feeding cups, syringe, straw, small teaspoon as measures to help these patients drink fluids safely. They may also recommend the use of thickeners to thicken up the fluids so that the patients would have better control of the fluid bolus.
5. As much as possible, self-feeding is recommended for patients with swallowing problems because it increases patients' attention and engagement in feeding. However, regardless of whether patients are self-fed or fed by caregivers, it can be difficult to ensure compliance to recommended strategies, especially for patients with psychological disorders or intellectual disabilities.

# Problem statement / Title

## Effective and affordable utensils for patients with swallowing difficulties

### Pain points

Existing treatments are not appropriate:

1. Children's feeding cups that are BPA-free are usually expensive and not age-appropriate. Adult patients may be embarrassed to use these childish looking cups. Furthermore, these cups usually need to be modified to suit adults i.e. flow rate.
2. Syringes are relatively cheap, however, they are recommended for one-time use only as they are difficult to clean and may not be suitable for hot fluids. This becomes an environmentally unfriendly option. Furthermore, syringes can result in fast flow rate if the plunger is pushed too quickly. This can compromise safety as the patients may choke on the fluids that are being squirted to the back of their mouths too quickly.
3. Straws are easily available and cheap but like syringes, an environmentally unfriendly option. For many of these patients with swallowing problems, they may not be able to suck or maintain suction for the fluid to be delivered into their mouths.
4. Small teaspoons allow for control of the fluid bolus size, however it may take a long time to feed the patients, leading to fatigue, which may in turn worsen the patients' swallowing function. This inefficient feeding method may also cause frustration for some patients.
5. The use of thickener in fluids would change the consistency and to a certain extent, mouth feel of the fluids. Some patients have reported that thickened fluids are less palatable and thus, reduce their intake of fluids.

Currently, it can be expensive and a hassle to trial the various feeding utensils to determine the most appropriate one for the patient. In most situations, we are dependent on the patient's family member to purchase the utensils for trial and error. Unfortunately, not all our patients have good social support or financial resources.

### Scale of problem / Impact of solution

Head and neck cancer:

"With at least 800 new cases every year, it is one of the most common cancers in Singapore," observes Dr Tan Hiang Khoon, Senior Consultant, Department of Surgical Oncology, National Cancer Centre Singapore (NCCS), a member of the SingHealth group. Worldwide, this cancer is on the rise in young patients, possibly due to an increased incidence of human papillomavirus (HPV) infection-associated cancer in young females and the increased incidence of thyroid carcinoma." (source: <https://www.healthxchange.sg/cancer/head-neck-cancer/head>)

Stroke:

"Over the years, the number of stroke episodes increased from 5,578 episodes in 2007 to 7,413 episodes in 2016." (source: <https://www.nrdo.gov.sg/docs/librariesprovider3/Publications>)

Spinal cord injury:

"The estimated global incidence of SCI is between 10.4 per million per year and 83 per million per year when individuals who died before hospital admission were excluded. These statistics however have mainly been collated from high-income countries in North America and Europe. There is scarce information on the prevalence and incidence of SCI in South America, Asia and Africa." (source: <https://open.library.ubc.ca/cIRcle/collections/ubctheses/24/items>)

If this product is well designed and is marketed at a competitive price, it may also be suitable for the paediatric population e.g. children with cerebral palsy.

### What you need from external partners

Design and create a utensil that:

- has a spout that is easy to receive and yet minimises spillage
- allows for a controlled flow rate
- is affordable and easily accessible for trial
- is safe for repeated use, including use for hot fluids
- is hygienic and easy to clean
- is aesthetically appealing for adult use
- is preferably environmentally friendly

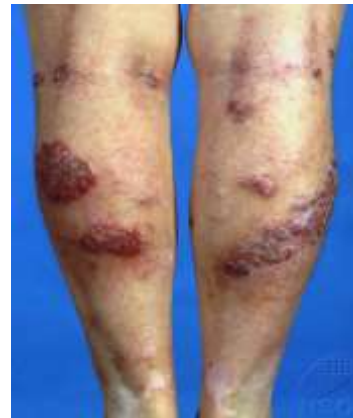
**[AL6]** A solution that allows people to apply topical cream accurately on target skin areas that are hard to reach, without requiring assistance

By Ms. Brenda Lim  
Head, Nursing, NSC

A solution that allows people to apply topical cream accurately on target skin areas that are hard to reach, without requiring assistance



# Extensive Skin Condition



# Prevalence of problem

1. Skin disease prevalence is between 1% and 20% of the global population.
2. Estimated data based on TTSH-NCID (excludes dermatology cases in other hospital) of 20 beds admission/month x 365 days x estimate \$300 per day = \$2,190.000
3. By 2020, Singapore should see almost 50,000 nurses, up from the current 36,000. With the ageing population, the need for nursing services will increase. The manpower would still be insufficient to meet the mounting needs. (Straight Times, Feb 18, 2013– Singapore faces shortfall of nurses for years to come; Nurse shortage is a global problem, Himss Asia Pacific,29, March 19).

# Pain points

1. It is time consuming to perform topical application of cream /lotion for patients with extensive skin conditions. The average time spent by nursing care staff for topical application could range from 10 – 30 min per procedure.
2. Skin care could be neglected by nursing care staff when there is a shortage of nursing manpower.
3. Currently in the market, there is no suitable applicator or tool to meet the need of patients requiring regular self application of topical medication form their skin conditions.



# Global Issues

1. <https://www.himssasiapac.org/content-library/exclusive-articles/nurse-shortage-global-problem>
2. <https://www.asiaone.com/health/singapore-faces-nurse-shortfall-years-come>