Considerations for a Geriatric Surgery Service

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Clinical Director, Geriatric Surgery Service
Khoo Teck Puat Hospital
Acute hospital of northern Singapore

Great Geriatric Department!

Khoo Teck Puat Hospital
Home to Transdisciplinary Geriatric Surgery Team since 2006

- Surgeons
- Anaesthetists
- Geriatric Medicine Physicians
- Cardiologist
- Nurse Clinician
- Physiotherapist
- Dietitian
- Medical Social Worker
- Pharmacist
- Befriender
Ageing

• Declining physiologic reserves
• May not be adequate in acute illness or surgical stress
Physiological Issues in Elderly Surgical Patients

Old Paris Hilton

Old Leonardo DiCaprio
Heart

- Reduced myocytes
- Increased collagen
- Decrease ventricular compliance
- Autonomic tissue changes
- Reduced max capacity
- ACS poorer outcomes
Respiratory

- Reduced chest wall compliance
- Loss of elasticity and collapse of small airways
- Responses reduced
- Reduced protective mechanism
- Prone to infection
Renal

- Capacity reduced
- Implications on pharmacology
Others

- Nutrition
- Dementia
Significant heterogeneity not only in physiologic alterations but also in associated co-morbidity and life expectancy
Frailty in the Elderly

Robustness

Pre-frail

Frail

Dependance

Biochemical & clinical markers

Disease
Phenotype of Frailty

- Sarcopenia
- Slow walking speed
- Cognitive deficits
- Hyponutrition
- Inactivity
Physical phenotype of frailty may reflect reduced functional reserves and thus intolerance to the trauma of major surgery.
How FRAIL is our approach to elderly patients undergoing major surgery?
Robust Geriatric Surgery - Requirements

Department of Surgery
Khoo Teck Puat Hospital
1. Robust Risk Stratification

- Building blocks to:
  - Better decision making for surgical indication and planning
  - Anticipatory perioperative management
  - Robust informed consent
What do we know on Surgical Outcomes?
Which Octogenarians Do Poorly After Major Open Abdominal Surgery in Our Asian Population?

Kok-Yang Tan, MRCS(Edin), MMed(Surg),
Chung-Ming Chen, FRCS(Edin), MMed(Surg), FAMS,
Chin Ng, FRCS(Edin), MMed(Surg), FAMS,
Su-Ming Tan, FRCS(Edin), MMed(Surg), FAMS,
Khoon-Hean Tay, FRCS(Edin), FRCS(Glas), FAMS

Department of General Surgery, Changi General Hospital, 2 Simei Street 3, 529889, Singapore
Colorectal surgery in octogenarian patients—outcomes and predictors of morbidity

K. Y. Tan • Y. Kawamura • K. Mizokami • J. Sasaki • S. Tsujinaka • T. Maeda • F. Konishi
Quantification of comorbidities and physiological status helps risks stratification for surgery in a very heterogeneous group of patients.
Tools for Pre-op Assessment

• ASA & Comorbidity index
  » Tan et al WJS 2006
  » Tan et al Int J Colorectal Dis 2008

• POSSUM, CR-POSSUM

• Barthels functional status

• Conventional biochemical markers
  • Alb
  • Renal function
  • FBC
Physiological and Operative Severity Score for the enUmeration of Mortality and morbidity (POSSUM)
## Physiological Possum

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>4</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td>&lt; 60</td>
<td>61 - 70</td>
<td>&gt; 71</td>
<td></td>
</tr>
<tr>
<td><strong>Cardiac + CXR</strong></td>
<td>No failure</td>
<td>Diuretic, digoxin, anti-anginal/hypertensive</td>
<td>Dyspnoea on exertion, moderate COPD</td>
<td>Resting dyspnoea, RR &gt; 30/min, fibrosis, consolidation</td>
</tr>
<tr>
<td><strong>Systolic BP</strong></td>
<td>110-130</td>
<td>131-170 or 100-109</td>
<td>&gt; 171 or 90-99</td>
<td>&lt; 90</td>
</tr>
<tr>
<td><strong>Heart rate/min</strong></td>
<td>50-80</td>
<td>81-100 or 40-49</td>
<td>101-120</td>
<td>&gt; 121 or &lt; 40</td>
</tr>
<tr>
<td><strong>GCS</strong></td>
<td>15</td>
<td>12 - 14</td>
<td>9 - 11</td>
<td>&lt; 8</td>
</tr>
<tr>
<td><strong>Hb</strong></td>
<td>13 - 16</td>
<td>11.5-12.9 or 16.1-17.0</td>
<td>10.0-11.4 or 17.1-18.0</td>
<td>&lt; 9.9 or &gt; 18.1</td>
</tr>
<tr>
<td><strong>WBC</strong></td>
<td>4-10</td>
<td>10.1-20.0 or 3.1-4.0</td>
<td>&gt; 20.1 or &lt; 3.0</td>
<td>&gt; 15.1</td>
</tr>
<tr>
<td><strong>Urea</strong></td>
<td>&lt; 7.5</td>
<td>7.6-10.0</td>
<td>10.1-15.0</td>
<td>&gt; 15.1</td>
</tr>
<tr>
<td><strong>Sodium</strong></td>
<td>&gt; 136</td>
<td>131-135</td>
<td>126-130</td>
<td>&lt; 125</td>
</tr>
<tr>
<td><strong>Potassium</strong></td>
<td>3.5 - 5.0</td>
<td>3.2 - 3.4 or 5.1 - 5.3</td>
<td>2.9 - 3.1 or 5.4 - 5.9</td>
<td>&lt; 2.8 or &gt; 6.0</td>
</tr>
<tr>
<td><strong>ECG</strong></td>
<td>Normal</td>
<td>Atrial fibrillation (rate 60-90/min)</td>
<td>Any abnormal rhythm, &gt; 5 ectopics/min, Q waves, ST/T wave changes</td>
<td></td>
</tr>
</tbody>
</table>
# Operative Possum

<table>
<thead>
<tr>
<th>Severity Score</th>
<th>1</th>
<th>2</th>
<th>4</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor</td>
<td>Moderate (colectomies)</td>
<td>Major (APR)</td>
<td>Major +</td>
<td></td>
</tr>
<tr>
<td>Multiple Procedures</td>
<td>1</td>
<td>2</td>
<td>&gt;2</td>
<td></td>
</tr>
<tr>
<td>Blood Loss (mls)</td>
<td>&lt;100</td>
<td>101-500</td>
<td>501-999</td>
<td>&gt;999</td>
</tr>
<tr>
<td>Contamination</td>
<td>None</td>
<td>Minor (serous)</td>
<td>Local pus</td>
<td>Free bowel content, pus or blood</td>
</tr>
<tr>
<td>Presence of Ca</td>
<td>None</td>
<td>Primary</td>
<td>Nodal mets</td>
<td>Distant mets</td>
</tr>
<tr>
<td>Mode of Surgery</td>
<td>Elective</td>
<td>Urgent</td>
<td>Emergency (immediate &lt;2hrs)</td>
<td></td>
</tr>
</tbody>
</table>

\[
x = (0.16 \times \text{physiologic score}) + (0.19 \times \text{operative score}) - 5.91
\]

Predicted Morbidity Rate = \[
1/(1 + e^{(-x)})
\]

\[
y = (0.13 \times \text{physiologic score}) + (0.16 \times \text{operative score}) - 7.04
\]

Predicted Mortality Rate = \[
1/(1 + e^{(-y)})
\]
Frailty Assessment
One must have 3 or more of the following criteria to be frail

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight Loss</td>
<td>Greater than 10lbs or 5% weight loss in the last year</td>
<td></td>
</tr>
<tr>
<td>15 foot Walk Time</td>
<td>Height ≤ 173 cm &lt; 7 seconds</td>
<td>Height ≤ 159 cm ≥ 7 seconds</td>
</tr>
<tr>
<td></td>
<td>Height &gt;173 cm ≥ 6 seconds</td>
<td>Height &gt;159 cm ≥ 6 seconds</td>
</tr>
<tr>
<td>Grip Strength</td>
<td>BMI ≤ 24 ≤ 29</td>
<td>BMI ≤ 23 ≤ 17</td>
</tr>
<tr>
<td></td>
<td>BMI 24.1 - 26 ≤ 30</td>
<td>BMI 23.1 - 26 ≤ 17.3</td>
</tr>
<tr>
<td></td>
<td>BMI 26.1 - 28 ≤ 30</td>
<td>BMI 26.1 - 29 ≤ 18</td>
</tr>
<tr>
<td></td>
<td>BMI &gt; 28 ≤ 32</td>
<td>BMI &gt; 29 ≤ 21</td>
</tr>
<tr>
<td>Physical Activity (MLTA)</td>
<td>&lt; 383 kcal / wk</td>
<td>&lt; 270 kcal / wk</td>
</tr>
<tr>
<td>Exhausation</td>
<td>A score of 2 or 3 on either question on the CES-D*</td>
<td></td>
</tr>
</tbody>
</table>

*How often in the last week did you feel this way?*

a) I felt that everything I did was an effort.
   b) I could not get going.

0 = 1 day; 1 = 1–2 days; 2 = 3–4 days; 3 = more than 4 days

BMI = Body Mass Index;
MLTA = Minnesota Leisure Time Activity Questionnaire;
CES-D = Center for Epidemiologic Studies Depression Scale.
Assessment for frailty is useful for predicting morbidity in elderly patients undergoing colorectal cancer resection whose comorbidities are already optimized

Kok-Yang Tan, M.B.B.S., M.Med.(Surg), F.R.C.S.\textsuperscript{a,*}, Yutaka J. Kawamura, M.D., Ph.D.\textsuperscript{b}, Aika Tokomitsu, M.D.\textsuperscript{b}, Terence Tang, MBBS, M.R.C.P.

\textsuperscript{a}Department of Surgery, Alexandra Health, Khoo Teck Puat Hospital, 90 Yishun Central, Singapore 768828, the Republic of Singapore; \textsuperscript{b}Department of Surgery, Saitama Medical Center, Jichi Medical University, Saitama, Japan; \textsuperscript{c}Department of Geriatric Medicine, Alexandra Health, Khoo Teck Puat Hosp., Singapore, the Republic of Singapore
## Correlation with Major Complication

<table>
<thead>
<tr>
<th></th>
<th>Risk</th>
<th>95% CI</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASA &gt; 3</td>
<td>1.048</td>
<td>0.323-3.400</td>
<td>0.938</td>
</tr>
<tr>
<td>WCIS &gt; 5</td>
<td>1.424</td>
<td>0.426-4.759</td>
<td>0.564</td>
</tr>
<tr>
<td>Frail</td>
<td>4.083</td>
<td>1.433-11.638</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>
Health status at the time of assessment
Retonaz et al in
Tan KY Ed. Colorectal Cancer in the Elderly, 2012
The Complex Geriatric Surgical Patient

- Comorbidity
- ADL dependent
- Frail

Complex Multifaceted Care
2. Robust Model of Care - Transdisciplinary
Adhoc, uncoordinated care rendered to patients not managed by Geriatric Surgery Service.
Transdisciplinary Approach

NURSE

MSW  BEFRIENDER  DIETICIAN  PHYSIOTHERAPIST

PATIENT

CARDIOLOGIST  GERIATRICIAN  PHARMACIST  ANAESTHETIST

SURGEON
Key Components of Khoo Teck Puat Hospital Transdisciplinary Geriatric Surgery Service

- Patient involvement
- Early Goal-setting Identifiable to team
- Integrative Decision-making and Care Planning
- Heightened communication
- Role enhancements
- Enhanced coordination
- Start to finish
3. ROBUST PERIOPERATIVE CARE PLAN
Early Setting of Goals

• Goals for Team
  – Care plan
  – Attention to details

• Goals for Patients
  – Return of function
  – Independence and QOL
    vs Survival
Start to Finish

- Dedicated Team manages from start to finish
KTPH Geriatric Surgery Workflow

75 years and above with diagnosis of cancer.

Extensive discussion with surgeon with patient & family about condition and treatment plans according to framework in appendix 1.

Nurse activates Geriatric Surgery team and performs geriatric assessment after surgeon establishes plan for surgery and goals.

Nurse also conveys assessment findings and jointly set goals to team.

Deltirum preventive measures will be incorporated as part of protocol in appendix 2.

Pre-operative education package will be provided by nurse.

Does patient satisfy 2 or more of the above?

Yes

Nurse performs Geriatric assessment to determine eligibility for prehabilitation:

<table>
<thead>
<tr>
<th>Type</th>
<th>Result</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frailty</td>
<td>Positive</td>
<td>Refer GSS protocol in appendix 2</td>
</tr>
<tr>
<td>WCIS</td>
<td>≥ 3</td>
<td>Moderate assistance</td>
</tr>
</tbody>
</table>

Patient undergoes either of the following prehabilitation for 2 weeks:
- Home based
- Outpatient
- Inpatient

Refer appendix 3 for more details.

No

Patient and family engagement in pre-operative education on nutrition and physical optimization.

Baseline data collection with GSS form.

Members from all specialty to review within 36hrs of activation on working day.

Treatment plans for peri-operative optimization made known to all members.

Patient undergoes elective surgery.
PREHABILITATION
HQIF research: Phase 1 – Rehabilitation Pre-surgery Optimization

GSS/HQIF patient → referred to GSS/HQIF Physiotherapist

Initial assessment done by GSS/HQIF Physiotherapist (2-4 weeks prior to surgery):
- A: Cardiovascular Status: 6 minute walk test
- B: Functional Lower Limb Strength: No. of Reps for ‘Sit to Stand’ or ‘Double-leg bridging’
- C: Balance: Functional Dynamic for ‘Time up and Go’
- Functional Status: Barthels and ADLs

Prior to discharge:
- Exercise plan discussed and taught to patient with log sheet and exercise guide provided.
- Arrange of appointment for outpatient rehabilitation in Clinic or home visits.
- Liaise with AMK DRC physiotherapist on exercise and outcome measure set for patient.

Discharge to home:

- **Outpatient Clinic**
  - Organize outpatient clinic session of twice per week.
  - Liaise with Outpatient Physiotherapist for exercise regimen.
  - During clinic session, exercises will be taught with usage of facilities.

- **Home**
  - Organize home visit session of twice per week with nurse.
  - Home assessment conducted with consideration for EASE program (installation of ramp, grip bar).

Discharge to AMK DRC:

- **AMK DRC**
  - Apply through AIC, under “GSS-Rehab”.
  - Organize DRC visit of twice per week with AMK-THKH physiotherapist.
  - Liaise with AMK-THKH physiotherapist on exercise regimen.

Phase 2 – post-op Rehabilitation intervention
HQIF research: Phase 1 - Pre-surgery Nutrition Optimization

HQIF patient → referred to HQIF Dietitian

Initial assessment done by dietitian (2-4 weeks prior to surgery):
- A: Current weight/weight changes, skinfold, midarm circumference and calf circumference
- B: Biochemistry – renal panel, calcium panel, lymphocytes count, albumin & Hb
- C: Medical condition and medications
- D: Diet history
- Subjective Global Assessment (SGA)
- Estimate energy & protein requirement (BEE using Mifflin equation x AF 1.15-1.3 x SF 1.2)

Prior to discharge:
- Dietary counseling (based on patient's condition e.g. DM diet) +/- low residue/fibre diet + oral nutrition supplement (if oral intake suboptimal) and give meal plan if necessary
- To discuss immuno-enhancing supplements with patient/family member (Grade A, ASPEN 2006)

Discharge to home:
- >8 days prior to surgery
  - To call patient/home visit at least once time weekly (after first assessment done) to collect dietary history and give advice accordingly (to ensure 100% of nutritional needs)
- 1-7 days prior surgery
  - To call patient/home visit at least one time weekly to collect dietary history and give advise accordingly (to ensure 100% of nutritional needs)
  - Start Oral Impact (immuno-enhancing nutrition) 7 days prior to surgery x 2-3 packets/day

Discharge to AMKCH:
- After first assessment done till surgery
  - To review patient two times a week (to ensure 100% of nutritional needs)
  - Start Oral Impact (immuno-enhancing nutrition) 7 days prior to surgery x 2-3 packets/day

Phase 2 – post-op nutrition intervention
<table>
<thead>
<tr>
<th>Component</th>
<th>Initial Assessment</th>
<th>One Week after prehabilitation</th>
<th>Two Weeks after prehabilitation</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education and Compliance</td>
<td>Understand disease and indication for surgery</td>
<td>Patient understands disease and indication for surgery</td>
<td>Patient understands disease and indication for surgery</td>
<td>Patient understands disease and indication for surgery</td>
</tr>
<tr>
<td></td>
<td>Knows what to expect</td>
<td>Patient knows what to expect</td>
<td>Patient knows what to expect</td>
<td>Patient knows what to expect</td>
</tr>
<tr>
<td>Preparation of Operation</td>
<td>Patient knows what to do</td>
<td>Yes □ No □</td>
<td>Yes □ No □</td>
<td>Patient knows what to do</td>
</tr>
<tr>
<td>Weight Change</td>
<td>Current Weight:</td>
<td>No Weight Loss □</td>
<td>No Weight Loss □</td>
<td>No Weight Loss Over past 2 weeks</td>
</tr>
<tr>
<td></td>
<td>Usual Intake:</td>
<td>Achieved 100% of dietary requirement 5 in 7days</td>
<td>Yes □ No □</td>
<td>Achieved 100% of dietary requirement 5 in 7days</td>
</tr>
<tr>
<td></td>
<td>Weight Loss &gt;5</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
</tbody>
</table>

Yes □ No □
POST OPERATION
Department of Surgery, Khoo Teck Puat Hospital
HQIF research: Phase 2 - Rehabilitation Post-surgery intervention

Patient admitted to hospital for surgery → activate GSS/HQIF Dietitian

Initial assessment done by GSS/HQIF Physiotherapist (1 day prior to surgery):

- A: Cardiovascular Status: 6 minute walk test
- B: Functional Lower Limb Strength: No. of Reps for 'Sit to Stand' or 'Double-leg bridging'
- C: Balance: Functional Dynamic for 'Time up and Go'
- Functional Status: Barthels and ADLs

OPERATION

Post-op till patient discharged:

Week 1-2
- To review patient's functional status continuously during hospitalization.
- Organise visit at home/outpatient at 2 times a week

Week 4
- To review patient's functional status and outcome measure

Week 6
- To review patient's functional status and outcome measure

If patient's to transfer to AMK-THKH for rehab
- To prepare the outcome measure form and discharge memo to AMKCH
  HQIF Physiotherapist
- Physiotherapist's role at AMKCH:
  - To review patient at least 2-3 times a week for rehabilitation activities and maintenance of physical activities
  - Outcome Measurement: (including Barthels)
    - Week 2; week 4 and week 6 as per outcome measure sheet
HQIF research: Phase 2 - Post-surgery Nutrition Intervention

Patient admitted to hospital for surgery → activate HQIF Dietitian

Initial assessment done by HQIF dietitian (1 day prior to surgery):
- A: Current weight/ weight changes,
- B: Biochemistry – renal panel, calcium panel, lymphocytes count, albumin & Hb
- C: Medical condition and medications
- D: Diet history
- Estimate energy & protein requirement (BEE using Mifflin equation x AF 1.15-1.3 x SF 1.2)

OPERATION

Post-op till patient discharged:

week 1-2
- To review patient at least 2 times a week to ensure adequate nutrition intake (via using enteral/ oral/ parenteral nutrition)
- Post-op diet advise L/ residue

week 4
- To review patient’s oral intake and advise accordingly
- Post op diet - aim L/fibre

week 6
- To review patient’s nutrition status by using SGA and to ensure adequate nutrition intake
- Post op diet - aim regular diet or DOC

If patient’s to transfer to AMKCH for rehab
- To prepare a discharge memo to AMKCH HQIF dietitian (Hwee Mei)
- Dietitian role at AMKCH:
  - To review patient at least 1 time a week to ensure adequate nutrition intake (via oral/ enteral nutrition)
  - Measurement:
    - Weight: week 4 and week 6 mark;
    - SGA to be repeated at week 6 mark
4. Robust management of Complications
5. Robust Outcome Measures
OUTCOME STUDIES ON OLDER PATIENTS UNDERGOING SURGERY ARE MISSING THE MARK

Joyce Chee, Tan Kok Yang
Journal of American Geriatric Society
JAGS Nov 2010; 58(11): 2238-40
A Collaborative Transdisciplinary “Geriatric Surgery Service” Ensures Consistent Successful Outcomes in Elderly Colorectal Surgery Patients

Kok-Yang Tan · Phyllis Tan · Lawrence Tan
Functional Outcomes of Elderly Adults who have Undergone Major Colorectal Resections

- Wang Zhongkai, Tan Kok Yang
- Journal of American Geriatric Society
- JAGS Dec 2013; 61(12): 2249-50

Mean follow-up of 91.2 months
93.6% had Barthels Index not inferior to preoperative score
Collaborative Transdisciplinary Approach
Standard Treatment
‘Start to finish trans-institutional transdisciplinary care’: a novel approach improves colorectal surgical results in frail elderly patients

C. L. K. Chia, S. K. Mantoo and K. Y. Tan

Department of General Surgery, Khoo Teck Puat Hospital, Singapore, Singapore

Received 17 May 2015; accepted 22 September 2015; Accepted Article online 23 October 2015
<table>
<thead>
<tr>
<th></th>
<th>No GSS (n=52)</th>
<th>GSS (n=29)</th>
<th>GSS + HQIF (n=49)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Age</td>
<td>80.0 (75-100)</td>
<td>82.9 (75-94)</td>
<td>78.9 (65-93)</td>
</tr>
<tr>
<td>% Emergency</td>
<td>19.2% (10)</td>
<td>20.6% (6)</td>
<td>16.3% (8)</td>
</tr>
<tr>
<td>ASA 3 and above</td>
<td>44.2% (23)</td>
<td>41.4% (12)</td>
<td>46.9% (23)</td>
</tr>
<tr>
<td>Clavien 3 and above</td>
<td>30.8% (16)</td>
<td>17.2% (5)</td>
<td>4.1% (2)</td>
</tr>
<tr>
<td>30 day mortality</td>
<td>9.6% (5)</td>
<td>6.9% (2)</td>
<td>2.0% (1)</td>
</tr>
<tr>
<td>Median LOS</td>
<td>9.5 (4-37)</td>
<td>7.0 (4-32)</td>
<td>7.0 (3-20)</td>
</tr>
<tr>
<td>Functional recovery</td>
<td>No data</td>
<td>84.6%</td>
<td>98.0%</td>
</tr>
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</table>
# Frail Cases before and after Implementation of Start-to-Finish Processes

<table>
<thead>
<tr>
<th></th>
<th>GSS</th>
<th>GSS + HQIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frail cases</td>
<td>25.0%</td>
<td>31.2%</td>
</tr>
<tr>
<td>Functional recovery at 6 weeks of frail cases</td>
<td>90.9%</td>
<td>100%</td>
</tr>
<tr>
<td>Mean LOS at KTPH</td>
<td>13.0 days</td>
<td>9.7 days</td>
</tr>
</tbody>
</table>
Novel Perioperative Models Make a Difference in Outcomes of Elderly Surgical Patients

Annals of Surgery 2013, 3 Oct, [Epub ahead of print]
Requirements of Geriatric Surgery Service

- Robust risk stratification
- Transdisciplinary model of care
- Start to finish care
- Outcomes that matter
To deliver progressive and collaborative surgical care with a passion for safety and a culture of compassion.