The Integrated Comprehensive Care Program (ICC): A Novel Home Care Initiative after Major Thoracic Surgery

Yaron Shargall, MD FRCSC
Disclosures

- I have no conflict of interest disclosures to report
The Readmission “Epidemic”

• Unexpected readmission after recent discharge
  - Relatively common event
  - Major financial burden to the healthcare system

• About 4.5 million Americans will be readmitted to hospitals annually ➔ Overall estimated cost of $44 billion to the healthcare system (not including physicians services)

• In Canada ➔ 30-day readmission rate is 8.5%
  - Estimated $2 billion cost (not including physicians fees)
The Readmission “Epidemic”

• Most preventable admissions occur within 1 month
  - Might be an indicator for quality of care
  - *USA Patient Protection and Affordable Care Act (2012)*
  Medicare penalties for hospitals with “higher than expected” readmission rates

• Key research findings:
  - Readmission is associated with increased mortality
  - Readmission into a different hospital - ↓outcomes
  - Most readmission risk prediction models perform moderately at most
  *(Kansagara, JAMA 2011)*
Site of Hospital Readmission and mortality

- Population-based retrospective analysis (1995-2010)
  - All acute care hospitals in the greater Toronto and Hamilton areas. Patients readmitted through the ER within 30 days post-discharge (n=2,448,759)
- Primary outcome \(\rightarrow\) Mortality within 30 days of readmission
- Overall readmission rate: 8.1%
- 30 day mortality- 19.2%

- Readmission to a different hospital associated with a higher risk of death \((p<0.001)\) (Staples, CMAJ Open 2014)
Preventing Early Hospital Readmissions

- Multiple studies, mostly non-surgical
- Recent meta-analysis of RCT’s (1990-2013):
  - 42 trials (GIM, Elderly, COPD), 100-700 pts each
  - Most conducted in academic centres
  - Only 3 with surgical population (combined with GIM)
  - Most interventions: simple discharge planning
  - Some included tele-homecare, telephone follow-up
- Consistent benefit on the risk of 30-day readmissions
  
  (Leppin, JAMA 2014)
Thoracic Surgery and Readmission

- Rates 10-17%
- Some volume-outcome relationship (Tsai, NEJM 2013)
- All studies population-based and retrospective
  - Pre-op comorbidities and in-hospital complications associated with higher readmission rate
  - Readmission after lung resection for lung cancer associated with 6-fold increase in mortality (Hu, J Thorac Cardiovasc Surg 2014)
  - Readmissions and ↑ mortality continue beyond 30 days
  - 20-25% readmitted to a different hospital
- Fast tracking - Most studies suggested beneficial effect
  - Several showed “protective effect” to longer admissions
The Integrative Comprehensive Care Program

- **Hypothesis:**
  1. Post-discharge active interventions could:
     - Reduce ER visits and hospital readmissions
     - No inferiority in adverse outcomes

  2. “One team-one care” approach is feasible
     - Discharging hospital’s accountability will **improve overall outcomes**
     - Continuity of care post hospital discharge will allow for shorter admission without compromising patients care
The Integrative Comprehensive Care Program

• Concept and Structure:
  - Hospital based homecare system. Nurse navigator based
  - Pre prepared care-pathways
  - Post discharge planning starts immediately post-op
  - Post discharge visits by RN’s, RPN’s, PT’s, RT’s, others
  - In hospital course stored electronically and available to all
  - On going communication between homecare team and NN
  - 24/7 contact point to patients and care givers.
  - Immediate action when needed (surgeons involved)
  - External validation
Objectives

• Compare first year of ICC implementation with previous year (patients treated by government-based agencies in pre-intervention cohort)
• Compare LOS, overall costs, 60-day readmission rates, 30-day ER visits, overall outcomes
• Review and evaluate infrastructure required for the ICC program an compare to pre-existing system
• Evaluate patient satisfaction
Methods

• Retrospective analysis of prospectively collected data
• Local Hospital dataset, MOH reporting dataset, provincial ER data, hospital charts review
• All patients undergoing lung resection or decortication at SJHH, malignant and benign etiology, discharged home
• Exclusion: in-hospital deaths, discharge to long-term facility
• Outcomes compared based on procedure type (VATS/open) and extent (lobar+/sub-lobar)
## Study Population

<table>
<thead>
<tr>
<th></th>
<th>Control Group (2011-2012)</th>
<th>ICC Group (2012-2013)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Count</strong></td>
<td>N=355</td>
<td>N=331</td>
<td>--</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>204 (58%)</td>
<td>157 (48%)</td>
<td>0.009</td>
</tr>
<tr>
<td>Female</td>
<td>150 (42%)</td>
<td>173 (52%)</td>
<td></td>
</tr>
<tr>
<td><strong>Age (Mean, SE)</strong></td>
<td>63.81 (0.783)</td>
<td>65.57 (0.711)</td>
<td>0.100</td>
</tr>
<tr>
<td><strong>CCI (Mean, SE)</strong></td>
<td>1.59 (0.119)</td>
<td>1.39 (0.111)</td>
<td>0.223</td>
</tr>
<tr>
<td><strong>FEV1, % predicted (Mean, SE)</strong></td>
<td>84.54 (1.542)</td>
<td>85.32 (1.442)</td>
<td>0.716</td>
</tr>
<tr>
<td><strong>DLCO, % predicted (Mean, SE)</strong></td>
<td>74.47 (1.442)</td>
<td>73.46 (1.187)</td>
<td>0.592</td>
</tr>
<tr>
<td><strong>Disease Type</strong></td>
<td></td>
<td></td>
<td>0.082</td>
</tr>
<tr>
<td>Primary lung cancer</td>
<td>214 (61%)</td>
<td>230 (70%)</td>
<td></td>
</tr>
<tr>
<td>Metastases</td>
<td>48 (14%)</td>
<td>35 (11%)</td>
<td></td>
</tr>
<tr>
<td>Benign</td>
<td>85 (24%)</td>
<td>61 (18%)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>2 (1%)</td>
<td>4 (1%)</td>
<td></td>
</tr>
</tbody>
</table>

**Median F/U**
- Control: 20m (0-46)
- ICC: 22m (0-35)

**Overall 60-day mortality < 1%**
Surgical Intervention by Group

Resection Type

- **Wedge**: 19% Control, 16% ICC
- **Multiple Wedge**: 11% Control, 8% ICC
- **Segmentectomy**: 11% Control, 7% ICC
- **Lobectomy**: 53% Control, 56% ICC (p=0.362)
- **Bilobectomy**: 2% Control, 2% ICC
- **Pneumonectomy**: 2% Control, 2% ICC
- **Pleural**: 0% Control, 0% ICC
- **Mediastinum**: 1% Control, 0% ICC
- **Other**: 4% Control, 5% ICC

Control vs ICC

McMaster University
## The ICC Team - overall impact

<table>
<thead>
<tr>
<th>Service Category</th>
<th>% of patients receiving service</th>
<th># of Visits</th>
<th>Average # of Visits/patient</th>
<th>Total Time (hours)</th>
<th>Average Time per patient (hours)</th>
<th>Total Cost for Service</th>
<th>Average cost per patient receiving service</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Thoracic Surgery</td>
<td>96%</td>
<td>3026</td>
<td><strong>8.7</strong></td>
<td>2095.7</td>
<td><strong>6.0</strong></td>
<td>$174,341.69</td>
<td><strong>$499.55</strong></td>
</tr>
<tr>
<td>Physiotherapist (N=6)</td>
<td>76%</td>
<td>553</td>
<td>2.0</td>
<td>410.1</td>
<td>1.5</td>
<td>$49,781.06</td>
<td>$181.02</td>
</tr>
<tr>
<td>Registered Practical Nurse (N=4)</td>
<td>75%</td>
<td>970</td>
<td>3.6</td>
<td>572.1</td>
<td>2.1</td>
<td>$44,067.10</td>
<td>$162.61</td>
</tr>
<tr>
<td>Registered Nurse (N=4)</td>
<td>63%</td>
<td>838</td>
<td>3.7</td>
<td>532.7</td>
<td>2.3</td>
<td>$49,067.10</td>
<td>$215.79</td>
</tr>
<tr>
<td>Respiratory Therapist</td>
<td>13%</td>
<td>167</td>
<td>3.6</td>
<td>170.0</td>
<td>3.7</td>
<td>$21,710.00</td>
<td>$471.96</td>
</tr>
<tr>
<td>Personal Support Worker</td>
<td>6%</td>
<td>214</td>
<td>9.3</td>
<td>217.5</td>
<td>9.5</td>
<td>$5,683.84</td>
<td>$247.12</td>
</tr>
<tr>
<td>Occupational Therapist</td>
<td>2%</td>
<td>17</td>
<td>2.1</td>
<td>34.0</td>
<td>4.2</td>
<td>$2,145.57</td>
<td>$268.20</td>
</tr>
<tr>
<td>Registered Dietitian</td>
<td>1%</td>
<td>5</td>
<td>1.0</td>
<td>3.1</td>
<td>0.6</td>
<td>$696.60</td>
<td>$139.32</td>
</tr>
<tr>
<td>Speech Language Pathologist</td>
<td>1%</td>
<td>7</td>
<td>2.3</td>
<td>18.4</td>
<td>6.1</td>
<td>$838.11</td>
<td>$279.37</td>
</tr>
<tr>
<td>ICC Coordinator</td>
<td>52% (100%)</td>
<td>255</td>
<td>1.4</td>
<td>137.7</td>
<td>0.7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Cost of hospital stay: $1350/day  (USA- $1975)
Length of stay by resection type

<table>
<thead>
<tr>
<th>Resection type</th>
<th>LOS (days)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open Sub-lobar</td>
<td>6.41</td>
<td>0.035</td>
</tr>
<tr>
<td>Open Lobar</td>
<td>8.51</td>
<td>0.283</td>
</tr>
<tr>
<td>VATS Sub-Lobar</td>
<td>4.39</td>
<td>0.322</td>
</tr>
<tr>
<td>VATS Lobar</td>
<td>6.43</td>
<td>0.114</td>
</tr>
</tbody>
</table>

Control

ICC
Total direct in-hospital costs per patient

<table>
<thead>
<tr>
<th>Resection type</th>
<th>Control</th>
<th>ICC</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open Sub-lobar</td>
<td>$14,742.94</td>
<td>$12,220.22</td>
<td>0.072</td>
</tr>
<tr>
<td>Open Lobar</td>
<td>$20,344.20</td>
<td>$15,487.51</td>
<td>0.183</td>
</tr>
<tr>
<td>VATS Sub-Lobar</td>
<td>$11,038.18</td>
<td>$8,505.39</td>
<td>0.007</td>
</tr>
<tr>
<td>VATS Lobar</td>
<td>$16,327.97</td>
<td>$12,772.77</td>
<td>0.074</td>
</tr>
</tbody>
</table>
Proportion of patients readmitted to hospital within 60 days of discharge by resection type

- All readmissions included
Proportion of patients admitted to ER within 30 days of discharge by resection type

<table>
<thead>
<tr>
<th>Resection Type</th>
<th>Control</th>
<th>ICC</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open Sub-lobar</td>
<td>26.7%</td>
<td>9.3%</td>
<td>0.140</td>
</tr>
<tr>
<td>Open Lobar</td>
<td>30.0%</td>
<td>18.3%</td>
<td>0.042</td>
</tr>
<tr>
<td>VATS Sub-Lobar</td>
<td>25.7%</td>
<td>13.9%</td>
<td>0.097</td>
</tr>
<tr>
<td>VATS Lobar</td>
<td>23.5%</td>
<td>10.2%</td>
<td>0.048</td>
</tr>
</tbody>
</table>
### Hospital Readmissions: Control vs. ICC group

<table>
<thead>
<tr>
<th></th>
<th>Control Group (2011-2012) n=42 (12%)</th>
<th>ICC Group (2012-2013) n=27 (8.4%)</th>
<th>p=0.891</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulmonary</td>
<td>11 (26%)</td>
<td>9 (33%)</td>
<td></td>
</tr>
<tr>
<td>VTE</td>
<td>3 (7%)</td>
<td>2 (7%)</td>
<td></td>
</tr>
<tr>
<td>Pain</td>
<td>1 (2%)</td>
<td>1 (4%)</td>
<td></td>
</tr>
<tr>
<td>Cardiac</td>
<td>4 (10%)</td>
<td>4 (15%)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>17 (40%)</td>
<td>8 (30%)</td>
<td></td>
</tr>
<tr>
<td>Empyema</td>
<td>4 (10%)</td>
<td>1 (4%)</td>
<td></td>
</tr>
<tr>
<td>Unknown</td>
<td>2 (5%)</td>
<td>2 (7%)</td>
<td></td>
</tr>
</tbody>
</table>

- Comparison between admitted to non-admitted groups-no pre-readmission predictors for readmission (both groups)
- 60 day mortality higher for readmitted patients (p=0.012), 5% control and 7% ICC (Overall mortality 1% in both groups)
Overall patient satisfaction of ICC cohort participants over enrolled time period

- Likert 5 points scale, 19.3% response rate
Discussion

• The first Thoracic Surgery study to date to evaluate the effect of a Post Discharge Intervention, starting pre discharge on patient outcomes after surgery
• Our results suggest that pro-active approach is beneficial and cost saving
• No inferiority in outcomes for the ICC group
• The significance of hospital accountability
• Patient confidence and satisfaction- very high
Study Limitations

- Retrospective analysis (of prospectively collected data)- potential for selection bias
  - The comparison between the groups is robust
  - The control group and local system are similar

- SJHH local homecare team (easier to implement, seamless transition from hospital to home)
  - Very simple learning curve
  - Small team, can be less skilled
  - Easy and simple communication post-discharge (generalizable)
Conclusions

• Initial experience with the innovative ICC one-team post-discharge intervention approach seems promising

• Active post-discharge interventions in Thoracic Surgery may lead to reduction in LOS, costs, ER and hospital readmissions

• No inferiority in outcomes

• Implementation is feasible. Simple learning curve

• Future studies needed re- different setups and healthcare systems
To overcome an imperfect hospital system and poor communication between hospital and post-hospital providers, a straightforward (but not easy) 4 step approach might be effective:

1. **Standardized discharge** process (checklist support)
2. Ask readmitted patients, care givers *and* healthcare providers to report how the system failed to meet their needs (debriefing)
3. Create **effective communication** between discharging hospital (and physicians) and patients/care givers/out of hospital providers. Communicate with **primary care physicians**
4. We must **empower patients** and their caregivers (through coaching and system redesign) to navigate the healthcare system

*Defragmenting Care: Jencks, Annals of Internal Medicine 2010*
The ICC program - future directions

- Expand patient population (Esophagectomy)
- Include government based and private support organizations → Teach and coach
- Expand to other institutions and healthcare systems
- Continue to monitor, debrief and improve
- Validate results
Thanks

- Anna Tran
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