Nurse coordinated CABG Clinical Pathway resulting in Shortening of Hospital Length of Stay and Improvement in Clinical Outcomes

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CABG Surgery

- There is **growing demand** for **coronary artery bypass grafting (CABG)**

- Because of high demand
  - to **shorten hospital length of stay**;
  - to **streamline the care process**
  - with **ensured clinical outcomes**

- Therefore, need for **CABG clinical pathway**.
CABG Clinical Pathway Development

- A clinical pathway
  1) multidisciplinary care
  2) guiding management
     a) specific group of patients
     b) anticipated clinical course.

- Its goal is to
  1) standardize management
  2) minimizing variability
  3) optimizing outcomes
Set up and implementation of CABG clinical pathway
CABG Clinical Pathway Development

- **Involved the multi-disciplinary team**
  - Cardiothoracic surgeons
  - Anaesthetists
  - Nurses,
  - Physiotherapists.

- **Designed by**
  - Reference on best-available evidence-based clinical practice
  - Iterations of drafts and reviews
  - Conducting pilot run
  - Continuous improvement
CABG Clinical Pathway Development

- fully integrated into patient’s peri-operative care, including:
  1) use of clinical investigations,
  2) post-operative care management,
  3) analgesia,
  4) mobilization schedules,
  5) physiotherapy,
  6) wound care, and
  7) communication with patient and family.

- Allows for
  - individualization of care
  - variances are documented and audited.
## Set Up CABG Clinical Pathway

### Care Map for elective CABG

<table>
<thead>
<tr>
<th>Date</th>
<th>Pre-Op/Admission</th>
<th>Day 0</th>
<th>Day 1</th>
<th>Day 2</th>
<th>Day 3</th>
<th>Day 4 - 5</th>
<th>Day 6 - 9</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Location</strong></td>
<td>General ward (GW)</td>
<td>GW to ICU</td>
<td>ICU to GW</td>
<td>ICU to GW</td>
<td>GW</td>
<td>GW</td>
<td>GW to Home</td>
</tr>
<tr>
<td><strong>Assessment &amp; Monitoring</strong></td>
<td>Preoperative checklist, Height, weight, Functional needs, Discharge planning needs</td>
<td>Monitoring &amp; assessment per ICU guidelines</td>
<td>Monitoring &amp; assessment per GW guidelines</td>
<td>Monitoring &amp; assessment per GW guidelines</td>
<td>GW guidelines</td>
<td>GW guidelines</td>
<td>Monitoring &amp; assessment per GW guidelines</td>
</tr>
<tr>
<td><strong>Investigation</strong></td>
<td>Cardiac Cath/Echo results, Open heart route for CABG</td>
<td>Lab tests, CXR, ECG</td>
<td>Lab tests, CXR, ECG</td>
<td>Lab tests, CXR, ECG</td>
<td>Blood for NA, K, CXR, ECG</td>
<td>Other test as indicated</td>
<td>Pre-discharge lab tests, CXR, ECG</td>
</tr>
<tr>
<td><strong>Medication</strong></td>
<td>Continue all meds except: Aspirin, Plavix, Warfarin, Prophylactic antibiotic, Fluid replacement</td>
<td>Titrated inotropes, vasodilators, sedations infusions as ordered, Prophylactic antibiotic, Fluid replacement, Early aspirin</td>
<td>Withdraw off infusion drugs, Return oral needs, especially, Aspirin, Beta Blocker, Lipid lowering agent, Discontinue for radial artery or femoral. Transition to oral analgesia</td>
<td>Adjust medications, Oral analgesia pm</td>
<td>Oral analgesia pm</td>
<td>Oral analgesia pm</td>
<td>Oral analgesia pm</td>
</tr>
<tr>
<td><strong>Treatment</strong></td>
<td>Heparin/trocar PM before &amp; AM of surgery, Bowel prep PM before surgery</td>
<td>Ventilator setting by anesthetist, Care for invasive lines &amp; tubes, Foley catheter to BSB, Early extubation, NGT – off when esophagus, Drains to suction as ordered, O2 therapy</td>
<td>Withdraw support and consider off invasive monitoring, Off/Off/zero drain(s), Extubation, Continue O2 therapy, wean as tolerated</td>
<td>No support and consider off invasive monitoring, Off/Off/zero drain, Extubation, Continue O2 therapy, wean as tolerated</td>
<td>Offf peripheral line, Remove all drains, Off Foley catheter if not placed</td>
<td>W/e off O2 as tolerated</td>
<td>No support and consider off invasive monitoring, Off/Off/zero drain, Extubation, Continue O2 therapy, wean as tolerated</td>
</tr>
<tr>
<td><strong>Activities</strong></td>
<td>Activity as tolerated or as ordered, Pre-op activity level documentation</td>
<td>Bed rest with HOB≥30° as tolerated, Sit up or chair position for 2-4 h after extubation, if appropriate</td>
<td>Serial precautions, Sit in chair, Ambulate with assistance, Antithrombotics stockings, remove BD</td>
<td>Serial precautions, Sit in chair, Ambulate with assistance, Antithrombotics stockings, remove BD</td>
<td>As indicated</td>
<td>As indicated</td>
<td></td>
</tr>
<tr>
<td><strong>Nutrition</strong></td>
<td>Continue normal diet, NPO after NPO per order</td>
<td>Advance diet as tolerated, NPO, Sips after extubation</td>
<td>Advance as tolerated, NPO, Sips after extubation</td>
<td>Advance diet as tolerated, NPO, Sips after extubation</td>
<td>Advance diet as tolerated, NPO, Sips after extubation</td>
<td>Advance diet as tolerated, NPO, Sips after extubation</td>
<td>Advance diet as tolerated, NPO, Sips after extubation</td>
</tr>
<tr>
<td><strong>Discharge Planning/Instruct</strong></td>
<td>Pre-op Teaching, Patient Pathway/Care Map, Incentive spirometer, Smoking cessation, Explain pre-op preparation, Initiate discharge planning</td>
<td>Orient patient to ICU routines, visitation policy</td>
<td>Reinforce pre-op teaching, Discharge teaching, Review discharge instructions</td>
<td>Continue assessment and planning for discharge needs, Review discharge plans, Reinforce discharge instructions</td>
<td>Continue assessment of discharge needs</td>
<td>Continue assessment of discharge needs</td>
<td>Consider Cardiac Rehab referral</td>
</tr>
<tr>
<td><strong>Outcomes</strong></td>
<td>Recovery from anesthesia and surgery, Monitor and treat any complications, Pain control</td>
<td>Monitor and treat any complications, Pain control, Skin integrity, Increasing ADLs’ mobility, Postop teaching in progress</td>
<td>Pain control, Skin integrity, Increasing ADLs’ mobility, Discharge teaching in progress</td>
<td>Pain control, Skin integrity, Resume normal ADLs/mobility, Discharge teaching in progress</td>
<td>Pain control, Skin integrity, Resume normal ADLs/mobility, Discharge teaching in progress</td>
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</tbody>
</table>
Implementation of CABG clinical pathway

- **Inclusion Criteria:**
  - elective cases for CABG

- **Exclusion Criteria:**
  - Urgent or emergency OT
  - Redo cases
  - CABG with other operations/ procedures:
    - CABG + Valve operations
    - CABG + VSD repair
    - CABG + Wedge resection of lung

- **Time frame:**
  - 29/6/2010 to 31/12/2013

- **Cases recruited:**
  - **362 cases**
    - total 531 cases of CABG done
    - 169 cases not recruited (urgent /emergency OT or OT with other procedures)
Demographics

- Age: range from 15 to 84; **mean age** 63.83 (+/- 10.13).
- Gender: Male: 84.3%; Female: 15.7%
CABG clinical pathway review

- 362 patients recruited into elective CABG clinical pathway
  - 227 (62.7%) patients followed the clinical pathway
  - 135 (37.3%) patients fell through from the clinical pathway

<table>
<thead>
<tr>
<th>Year</th>
<th>Clinical Pathway</th>
<th>Total cases</th>
<th>Followed cases</th>
<th>Fell through cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010 (June – Dec)</td>
<td>61</td>
<td>34 (55.7%)</td>
<td>27 (44.3%)</td>
<td></td>
</tr>
<tr>
<td>2011</td>
<td>108</td>
<td>61 (56.5%)</td>
<td>47 (43.5%)</td>
<td></td>
</tr>
<tr>
<td>2012</td>
<td>84</td>
<td>57 (67.9%)</td>
<td>27 (32.1%)</td>
<td></td>
</tr>
<tr>
<td>2013</td>
<td>109</td>
<td>75 (68.8%)</td>
<td>34 (31.2%)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>362</td>
<td>227 (62.7%)</td>
<td>135 (37.3%)</td>
<td></td>
</tr>
</tbody>
</table>
Risk score (Euro/ QMH risk score)

- The risk score reflected the **baseline patient condition** including:
  - age, co-morbidities
  - previous myocardial insults
  - other pre-operative conditions of patients.

- **Higher risk score** would be **more likely to fall through**
  (poorer pre-operative health status, more co-morbidities and higher risk for surgery)

<table>
<thead>
<tr>
<th></th>
<th>Euro score (additive)</th>
<th>Euro score (logistic)</th>
<th>QMH risk score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total cases</td>
<td>3.38 (+/- 2.62)</td>
<td>3.54 (+/- 4.13)</td>
<td>2.19 (+/- 1.79)</td>
</tr>
<tr>
<td>Followed cases</td>
<td>2.87 (+/- 2.32)</td>
<td>2.70 (+/- 2.69)</td>
<td>1.85 (+/- 1.56)</td>
</tr>
<tr>
<td>Fell-through cases</td>
<td><strong>4.21 (+/- 2.84)</strong></td>
<td><strong>4.86 (+/- 5.48)</strong></td>
<td><strong>2.75 (+/- 1.99)</strong></td>
</tr>
<tr>
<td>Significance</td>
<td>p &lt; 0.000</td>
<td>p &lt; 0.000</td>
<td>p &lt; 0.002</td>
</tr>
</tbody>
</table>
Review, analysis and implementation of improvements
Review and audit

- Among 362 cases, 135 cases fell through
- “Fell through” cases are sorted into 6 categories.
- Search for systemic factors and formulate improvement measures
Among 362 cases, post-op complications occurred:
- most common: leg wound infection & post-op atrial fibrillation (AF)
- Others: Urinary tract infection (UTI), renal failure
Nurse-led improvement measures

- Day Centre team reviewed the results and conducted nurse-led improvement measures including:

1. Length of hospital stay (LOS) expectation management

2. More comprehensive patient education
   - provided for patients and family members better understanding of patient care.

3. Patient partnership programs with telephone hotline
   - help relief their anxiety and concerns arisen from the shorten hospital stay.
Improvement in clinical outcomes

- Nurse-led improvement measures:
  - Social factors
    - LOS expectation management
    - Confirm post-op homecare arrangements before operation.
  - System factors
    - Reserve post-op general bed for pathway cases.
  - Clinical factors
    - Keep tract with pathway milestones:
      - Early off IV, CVP, foley if pt conditions fits to avoid clinical complications
- Noted improvement with the decrease in occurrences of the incidents.
Improvements in post-op complications

- Improvement measures taken to prevent post-op complications:
  - Early resume of Beta-blockers
    - to prevent post-op AF
  - Ensure early removal of Foley’s catheter
    - to prevent urinary tract infection (UTI)
  - Pre-op arrangement for renal impaired or renal failure patients
    - to prevent post-op renal failure
- Noted improvement with the decrease of occurrence of these complications
Results and Outcomes
Shorten Length of Stay  
(Before and After)

- Outcomes compared with historic control group of 488 patients receiving surgery 4 years preceding its introduction.

- The mean post-operative length of stay (LOS) significantly reduced
  
  13.16 ± 7.25 versus 9.03 ± 6.32 days \( (p<0.000) \)

**Nurse coordinated CABG clinical pathway resulting in shortening of hospital length of stay**

<table>
<thead>
<tr>
<th>Shortening of Length of Stay after implementation of CABG clinical pathway</th>
<th>Before implementation</th>
<th>After implementation</th>
<th>Days Shortened</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>13.16 (+/- 7.25) days</td>
<td>9.03 (+/- 6.32) days</td>
<td>4.13 days</td>
<td>( p &lt; 0.000 )</td>
<td></td>
</tr>
</tbody>
</table>
Shorten Length of Stay
(Followed Vs Fell-through cases)

- Of 362 patients, mean post-operative LOS for followed further significantly reduced compared to fell through cases
  - $6.75 \pm 1.32$ versus $12.79 \pm 9.03$ days, ($p<0.000$)

| Nurse coordinated CABG clinical pathway resulting in shortening of hospital length of stay |
|------------------------------------------------------|-----------------|-----------------|-----------------|-----------------|
| Shortening of Length of Stay for cases who follow the CABG clinical pathway | Followed cases | Fell Through cases | Days Shortened | Significance |
| | 6.75 (+/- 1.32) days | 12.79 (+/- 9.03) days | 3.76 days | $p < 0.000$ |
Improvement of rate in following CABG clinical pathway

- Noted improvement in the rate of cases able to follow CABG clinical pathway
- The rate of cases able to follow the pathway improved to **67.9% & 68.8%** (previous ~55%).

<table>
<thead>
<tr>
<th></th>
<th>2010 (1/2 yr)</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOS of cases <strong>followed</strong> the pathway</td>
<td>7.44 days (+/- 1.75)</td>
<td>6.26 days (+/- 1.25)</td>
<td>6.16 days (+/- 1.15)</td>
<td>7.58 days (+/- 1.11)</td>
</tr>
<tr>
<td>LOS of cases <strong>fell thru</strong> from the pathway</td>
<td>11.79 days (+/- 8.91)</td>
<td>11.4 days (+/- 8.74)</td>
<td>13.6 days (+/- 8.23)</td>
<td>15.74 days (+/- 11.24)</td>
</tr>
<tr>
<td>Significance</td>
<td>p&lt; 0.000</td>
<td>p&lt; 0.000</td>
<td>p&lt; 0.000</td>
<td>p&lt; 0.000</td>
</tr>
<tr>
<td>Cases able to follow CABG clinical pathway</td>
<td>55.7%</td>
<td>56.5%</td>
<td><strong>67.9%</strong></td>
<td><strong>68.8%</strong></td>
</tr>
</tbody>
</table>
Accepting higher risk patients with stable clinical outcomes

- We were handling **more complex patients with higher risks, higher risk scores, more complicated cases.**
- Yet we were still able to maintain a relative **stable clinical outcomes.**
- Also the patients recruited were **more able to follow the clinical pathway in the recovery process.**

<table>
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<tr>
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<th>2010 (1/2 yr)</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
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</thead>
<tbody>
<tr>
<td>Mean Euro score (logistic)</td>
<td>2.89 (+/- 2.82)</td>
<td>3.51 (+/- 3.55)</td>
<td>3.93 (+/- 5.26)</td>
<td>3.78 (+/- 4.69)</td>
</tr>
<tr>
<td><strong>Rate</strong> of cases able to follow CABG clinical pathway</td>
<td>55.7%</td>
<td>56.5%</td>
<td>67.9%</td>
<td>68.8%</td>
</tr>
<tr>
<td>Average LOS in cases able to follow CABG clinical pathway</td>
<td>7.44 days (+/- 1.75)</td>
<td>6.26 days (+/- 1.25)</td>
<td>6.16 days (+/- 1.15)</td>
<td>7.58 days (+/- 1.11)</td>
</tr>
</tbody>
</table>
Achieving Milestones of the clinical pathway

- After implementation of the clinical pathway, patients who followed the clinical pathway can achieve the recovery milestones including:
  - early extubation;
  - early aspirin in-take;
  - weaning off inotropic support;
  - early transfer to general ward;
  - early removal of Foley’s catheter;
  - early sit out;
  - early ambulation;
  - early bowel movement;
  - and discharge within Day 5 to Day 9.

Serve as a checklist to guide clinical practice

Keep track of patient recovery progress

Ensured EBP practice

Improved clinical outcomes

Completed pathway & Discharge home

↓LOS
Ensured proven effective treatment are given

- Early aspirin improve vein graft patency
- Best to take within 6 hours after operation, no benefit if >48 hours

*Saphenous Vein Graft Patency 1 Year After Coronary Artery Bypass Surgery and Effects of Antiplatelet Therapy
Results of a Veterans Administration Cooperative Study*
S Goldman, J Copeland, T Moritz, W Henderson, K Zadina, T Ovitt, J Doherty, R Read, E Chesler and Y Sako
*Circulation* 1989;80;1190-1197
Ensure early Aspirin intake

- Noted team effort for early aspirin intake.
  - Ensure aspirin given within 6 hour after operation.
- Change traditional routine practice:
  - given Aspirin via Ryles’ tube even before extubation.
- Rate of early intake of aspirin improved

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early aspirin</td>
<td>82%</td>
<td>98.2%</td>
</tr>
</tbody>
</table>
Early removal of Foley’s catheter

- Review on post-op complications of UTI.
- Audit on compliance of pathway.
- Ensured early removal of Foley’s catheter.
- Rate of early removal of Foley’s catheter improved:

<table>
<thead>
<tr>
<th>Early removal of Foley</th>
<th>2010</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage</td>
<td>78.7%</td>
<td>91.7%</td>
</tr>
</tbody>
</table>

- Complication rate of UTI decreased.
Early Sit Out and Mobilization

- Team effort to encourage early sit out & mobilization.
- Noted improved rate of early sit out and ambulation:

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early Sit Out</td>
<td>68.9%</td>
<td>96.3%</td>
</tr>
<tr>
<td>Early Ambulation</td>
<td>72.1%</td>
<td>94.5%</td>
</tr>
</tbody>
</table>
Early Bowel Movement (BO)

- Review of result shown poor compliance in early BO.
- Audit and reinforce routine Rx of laxatives if not yet BO on post-op D4.
- Ensure nurses checking on patients’ post-op BO.
- Rate of early BO improved:

<table>
<thead>
<tr>
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<th>2010</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early BO</td>
<td>27.9%</td>
<td>91.7%</td>
</tr>
</tbody>
</table>
Outcomes

The CABG clinical pathway

- served as a **checklist** to prompt the staffs to perform patient care in a systematic way

- **ensured** **proven effective treatments** were given to patients by following the pathway
Acknowledgement:
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