A Productivity Index for NSW Operating Theatres

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What is a Productivity Index?

- Productivity is defined as the quantity of outputs produced per unit of input.
  \[
  \frac{Outputs}{Inputs}
  \]

- The ACI Operating Theatre (OT) Efficiency Guidelines identified the need to develop a standardised method of assessing OT productivity:
  - Allow comparisons over time and between different hospitals, theatres, surgical specialties and surgeons
  - Defining ‘productivity’ for operating theatres is complex.
Key points about a Productivity Index

- It is a **relative** concept
  The value exists when it's used to **compare** productivity over time or with other entities.

- It is **not** the same as efficiency
  A better PI result does not automatically mean you are more efficient.

- It is **one** of tools in the Operating Theatre Efficiency Guidelines toolkit
Developing an Operating Theatre Productivity Index

- Literature search revealed there has been limited work in this area.
- Begin with **elective in-theatre** productivity only
- Use data that we have readily available
- Refine and expand over time
Algebraically....

The Productivity Index formula is:

\[ \text{OTPI}_t = \frac{\text{Output}_t}{(L_t + C_t)} \]

Where:

- \( \text{OTPI}_t \) = Operating Theatre Productivity Index (time period)
- \( \text{Output}_t \) = sum of surgical NWAUs
- \( L \) = sum of the costs of the mix of labour hours used (surgeon, anaesthetist, nursing).
- \( C \) = sum of costs not associated with labour used
- \( t \) = time period
What is the NSW OT Productivity Index?

- The OT Productivity Index is expressed as the number of surgical NWAUs produced (output) per $1,000 of resources used in surgery (input).

<table>
<thead>
<tr>
<th>Included</th>
<th>Excluded</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labour mix and costs (input)</td>
<td>Theatre utilisation (time) as that is a separate metric in the OT Efficiency Guidelines</td>
</tr>
<tr>
<td>OT room costs (input)</td>
<td>Pre-surgical work up and post-theatre care components</td>
</tr>
<tr>
<td>Patient complexity (output)</td>
<td>Quality measures</td>
</tr>
</tbody>
</table>
A word about NWAUs

What is a National Weighted Activity Unit (NWAU)

- An NWAU is used as the basis for payment across NSW Health
- Each surgical DRG separation is given an NWAU
- It is a price weight for activity and reflects resource consumption of that activity.
- The higher the NWAU weight, the more complex a patient
- OTPI uses the NWAU to count activity and weight that activity for complexity
Data sources for calculating the OTPI

- Key data source is the ABM portal
- Data is analysed at a surgical DRG level
- For each surgical DRG the portal provides
  - costs buckets for inputs (medical and operating theatre)
  - NWAuS (outputs)
- The data in the Portal comes from your facility/LHD
### Quick Report - Aggregate Analysis

#### Current Selections
- **ABF Status**
- **Peer Group**
- **Class**
- **Classification**
- **WP**
- **Activity Year**

#### Activity Year
- 2013-2014

#### Selections
- **LHIDESH-IN**
- **Facility**
- **ABF Status**
- **Fin Program**
- **Class**
- **Peer Group**
- **Same Day Flag**
- **Care Type**
- **Principal Diagnosis**
- **Principal Procedure**

#### My Report in $(K)

<table>
<thead>
<tr>
<th>Class</th>
<th>Total NWAU(15)</th>
<th>Allied</th>
<th>Mod</th>
<th>Nurse</th>
<th>Critical Care</th>
<th>Imag</th>
<th>OR</th>
<th>Path</th>
<th>Pharm</th>
<th>Pros</th>
<th>SPS</th>
<th>Ward &amp; ED Supplies</th>
<th>Non Clinical</th>
<th>On Cost</th>
<th>Exclude</th>
</tr>
</thead>
<tbody>
<tr>
<td>104B-KNEE REPLACEMENT - CSCC</td>
<td>5,657,900</td>
<td>914</td>
<td>1,108</td>
<td>2,196</td>
<td>102</td>
<td>162</td>
<td>4,108</td>
<td>205</td>
<td>144</td>
<td>8,032</td>
<td>530</td>
<td>1,010</td>
<td>722</td>
<td>320</td>
<td></td>
</tr>
</tbody>
</table>

### Dimensions
- **ACEP Service stream**
- **ACEP Status**
- **Admission Category**
- **Admission Type**
- **Gender**
- **RTH Flag**
- **Indigenous Status**
- **LHIDSH-IN**
- **Mode of Arrival**
- **Patient Age**
- **SNAP Class**
- **Specialty**
- **Start Date**
- **Tier 2**

### Activity Metrics
- **LPHA**
- **Encounter**
- **ICU Hours**
- **Inpatient ALOS**
- **Total NWAU**

### Expense Metrics
- **Avg Cost / Lact**
- **Avg Cost / NWAU**
- **Total Cost($)**
- **Total NWAU Cost($)**

### Cost Metrics
- **Med**
- **Non Clinical**
- **Nurse**
- **On Cost**
- **Exclude**
- **Path**
- **Pharm**
- **Pros**
- **SPS**
- **Ward & ED Supplies**

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**NSW Agency for Clinical Innovation**

**ACI**
Examples of how the OTPI can be used

- **Key Concepts**
  - The comparator is always set to a value of 1
  - An OTPI of **less than 1** indicates *lower* productivity than the comparator
  - An OTPI of **greater than 1** indicates *higher* productivity than the comparator

- 3 examples of how the OTPI can be used are provided.
  Productivity Index for one principal referral hospital (Hospital A) for one DRG (104B – Knee replacement W/O Catastrophic or Severe CC).
Example 1: Year on Year OTPI

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Activity Metrics</th>
<th>Expense Metrics</th>
<th>Cost Metrics</th>
</tr>
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<tbody>
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<td></td>
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| 2012/13 |

Hospital A had 169 separations for DRG I04B producing a total of **665 NWAUs** (Output).
The OT resources used to produce those NWAUS was **$729,000** (Input).
The OTPI for 2012/13 is calculated as:-

\[
\text{OTPI} = \frac{\text{Output}}{\text{Input}} = \frac{665}{729} \approx 0.91
\]

This means that in 2012/13 Hospital A produced 0.91 NWAUs for every $1,000 spent in the operating theatre.
Example 1: Year on Year OTPI

Hospital A had 163 separations for DRG 104B producing a total of 643 NWAUs.
The OT resources used to produce those NWAUS was $781,000.
The OTPI for 2013/14 was:-

\[
\text{OTPI} = \frac{643}{781} = 0.82
\]
Example 1: Year on Year OTPI

- The OTPI 2012/13 for Hospital A is set as the Base Year of comparison (0.91/0.91 = 1).

- To calculate the Year on Year OT Productivity Index, the latest PI for the hospital is divided by the previous year’s as we are measuring the change in PI over the years. That is:-

\[
\text{OTPI}_{Yr13/14}/\text{OPTI}_{Yr12/13} = 0.82/0.91 = 0.9
\]
Example 1: Year on Year OTPI

This means that in 2013/14, Hospital A produced **10% less** NWAUs for every $1,000 spent on surgery knee replacements (without catastrophic or severe CC).
Example 1: Why is this year different?

There are a number of ways to investigate OTPI Results:

- **Look at inputs**
  - Staffing mix
  - Costing system

- **Look at outputs**
  - Coding

- **Review other Theatre utilisation efficiency metrics**

- **LHD/Hospital operational and strategic policy decisions**
**Example 2: Hospital to LHD OTPI**

The basis of comparison is the LHD OTPI for 2013/14 which is **0.89**, and is set at 1.

To calculate the Hospital to LHD OTPI for Hospital A, Hospital A OTPI/LHD OTPI:

\[ \frac{0.82}{0.89} = 0.93. \]

This means that in 2013/14, Hospital A produced **7%** less knee replacement NWAUs for every $1,000 spent in theatre compared to the LHD average.
Example 2: Hospital to LHD OTPI

Why is Hospital A different to the LHD average?

- Examine issues in previous example
  Are costing being allocated appropriately across the LHD?
  Is activity being recorded appropriately?
  Is the surgical staffing mix different to other hospitals in the LHD?

- Look at PI of other Hospitals within an LHD and talk to those performing better

This information can assist an LHD to decide where best to allocate different types of surgery within an LHD.
Example 3: Hospital to Peer Group OTPI

The 2013/14 Peer Group OTPI is 1.13.

To calculate the OTPI of Hospital A therefore is:

\[ \frac{0.82}{1.13} = 0.73. \]

This means that in 2013/14, Hospital A produced 27% less knee replacements NWAUs for every $1,000 spent compared to the Peer Group average.
Example 3: Hospital to Peer Group OTPI

Why is Hospital A so different to the Peer Group Average?

- Go to Hospital PR4 as the “best” performer
- Are their costs better managed or is their throughput more effective?
- What is their staffing mix like?
- How do they allocate their theatre costs?
- What OT efficiency strategies do they have in place to get more patients through?
How can I improve my productivity?

- Productivity can be improved by adjusting the level of inputs or outputs or both

- Some examples of potential approaches:
  - Implementing the OT efficiency guidelines
  - Improve costing systems
    - OT standard costs template
  - Improve coding of activity
    - OT Efficiency Data dictionary
  - Clinical redesign processes
  - Improvements in technology
What Next?

- The next piece of work is to link data (surgingen/surgical data with admitted patients data collection) so that OTPIs can be prepared and compared at a theatre and surgeon level.

- The ACI is keen to work with self-nominated pilot sites to develop this next stage of analysis.

- We are inviting 6 sites to nominate work with us – mix of metro and rural based hospitals.