Internet of Things (IoT)

- Internet of things (IoT) is an emerging technology where different machines are embedded with sensors to capture and relay data to each other.
- Mackenzie Health (MH) implemented IoT in an acute medical unit to test and evaluate new technologies to improve care delivery.
- The new system includes: smart beds, smart hand hygiene system, wall call stations, dome light indicators, and smart call system.

Research Gap: No evidence produced to confirm the benefits of this intervention

Methodology

RQ1) Evaluation:
- Interrupted Time series analysis to compare the pre and post intervention efficiency (length of stay) and patient safety (patient fall rate).
- Applied Rogers’ Diffusion of Innovation Theory for nurse experience measurement.
- Statistical analysis to measure Hand-Hygiene compliance rate and patient call response time.

RQ2) Future Improvements:
- Discrete Event Simulation (DES) for future call routing improvement scenarios.

Results – RQ1

<table>
<thead>
<tr>
<th>Efficiency</th>
<th>Patient Safety</th>
<th>Timeliness</th>
<th>Staff Experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>A non-significant incremental change post-intervention.</td>
<td>A non-significant incremental change post-intervention.</td>
<td>Increased up to 2015 followed by a decrease over 2015-2016.</td>
<td>Mixed trends in four main types of call response times.</td>
</tr>
</tbody>
</table>

Results – RQ2

- Tested 3 alternative patient call routing scenarios:
- “Proximity” – nearest available nurse is sent call.
- “Call Alternate Pod” (CAP) – call is sent to a less busy pod of nurses for them to assist.
- “Call by Licensure” - calls are sent to relevant staff based on call type (e.g., bathroom calls sent to Personal Care Aids (PCAs)/Support Workers.

- Mean response times could be further reduced by ~6-18% depending on call strategy.
- Nurse travel distance can be reduced by up to ~20%.

Conclusion

1. Application of IoT at MH improved the efficiency (length of stay), patient safety (patient falls, HH-compliance rate), timeliness (patient call response time) and staff experiences.
2. Further improvement in unit operations is possible through the use of alternative patient call routing strategies.

Acknowledgements

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Table 1: Smart Technologies Implemented in MH

<table>
<thead>
<tr>
<th>Smart Bed</th>
<th>Smart badge</th>
<th>Blackberry Mobile Phones</th>
<th>Dome light indicators</th>
<th>Wall Call Station</th>
<th>Hand Hygiene Support Solution</th>
</tr>
</thead>
</table>

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