TRANSLATING GUIDELINES INTO PRACTICE: IMPROVING CONTINUOUS GLUCOSE MONITORING DEVICE VALIDATION FOR PATIENTS USING INSULIN PUMPS DURING HOSPITALIZATION

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BACKGROUND

- Type 1 Diabetes increasing in prevalence in both adults and children
  - 3% annual increase since 2000 (t1dindex.org)
  - 1 out of every 30 families impacted (t1dindex.org)
- Covid increases risk for newly diagnosed diabetes (T1D and T2D) (Barrett et al., 2022; Metwally et al., 2021)
SIGNIFICANCE

• Approximately 60% of T1D patients choose wearable diabetes technology to manage glucose (Foster et al., 2019)

• National organizations recommend continuation of diabetes technology during hospitalization (Elsayed et al., 2023; Galindo et al., 2020; Korytkowski et al., 2022)

• CGM and AID not FDA approved for inpatient management
• Wearable diabetes technology
  • Insulin pumps
  • Continuous Glucose Monitors (CGMs)
  • Automated Insulin Delivery (AID) mode

• Improves glycemic measures (time in range) and outcomes (reduced A1c) (Elsayed et al., 2023; Galindo et al., 2020; Korytkowski et al., 2022)
DIABETES TECHNOLOGY - CGM

- Interstitial glucose vs capillary glucose
- Unknown effects on device accuracy
  - Dehydration
  - Fluid overload
  - Acidosis
  - Vasoactive infusions
  - External radiation
- Know effects on device accuracy
  - Hydroxyurea
  - Acetaminophen
  - Vitamin C
June 2021 TJC issued Quick Safety 59: Safe use of insulin pumps and CGM devices during hospitalization

- Personal glucose testing devices (CGMs) should be validated for accuracy against hospital’s glucose meter
TIMELINE OF IMPROVEMENT

June 2021
Gap Analysis

August 2021
Updated Clinical Practice Guideline

October 2021
CGM LDA Avatar auto populate validation rows

January 2022
CBL updated

May 2022
Compliance with CPG 17%
Clinical decision support (CDS) provides clinicians with knowledge and person-specific information, intelligently filtered or presented at appropriate times, to enhance health care (ONC, 2018).

- Computerized alerts or reminders
- Condition specific order sets
- Clinical guidelines
- Focused data reports
- Documentation templates

CDS benefits include increased quality of care, avoidance of adverse events, and improved efficiency and clinician satisfaction.
The purpose of the evidenced based review of the literature was to answer the following nursing practice question:

Among nurses working in inpatient settings (P), does clinical decision support embedded within the EHR (I), improve adherence to clinical practice guidelines (O) during hospitalization (T)?
REVIEW OF LITERATURE

1. Clinical Decision Support Systems
2. Nurst* Guideline Adherence

- 3 Integrative reviews
- 1 RCT
- 1 Quasi experimental
REVIEW OF LITERATURE

Themes

1. CDS embedded within the EHR that provides actionable information improves nursing process outcomes

2. CDS commonly implemented along with educational intervention thereby limiting knowledge on the impact of CDS alone

Sufficient but not strong evidence to support the use of CDS that is embedded within the EHR to improve nursing adherence to CPGs
THEORETICAL FRAMEWORK

Diffusion of Innovation Theory states that there are specific characteristics that determine adoption of new technology:
1. Observability – degree to which results of innovation are visible to adopters
2. Relative advantage – degree to which innovation is perceived to be superior to current practice
3. Compatibility – degree to which the innovation is perceived to be consistent with socio-cultural values, previous ideas, and/or perceived needs
4. Trialability – degree to which innovation can be experience on a limited basis
5. Complexity – degree to which an innovation is difficult to use or understand

Distribution of adopters
IMPLEMENTATION FRAMEWORK

Project Aim:

Increase the percentage of patients admitted to the hospital wearing an insulin pump and a CGM who have their CGM validated per the institutional clinical practice guideline.
1. **PLAN** - Develop a test of change

   - Form a team: Collaboration with nurse informaticist
   - Set the Aim: Improve RN documentation
   - Establish measures: CGM validation per CPG
   - Test of Change: Nursing task for Epic “brain”
Active LDAs and Wound Care

- Insulin Subcutaneous Infusion Set
  - Placement Date/Time: 03/23/23 16:48
  - Location Orientation: Lower Right Site: Abdomen
  - Inserted by: In place on arrival to facility
  - Obvious device defects (cracks, broken or missing dials, etc) causing pump to be inoperable: No
  - Days: 0

- Continuous Glucose Monitor
  - Placement Date/Time: 03/23/23 16:48
  - Location Orientation: Left; Lower Site: Abdomen
  - Inserted by: In place on arrival to facility
  - Days: 0
<table>
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<tr>
<th>Admission (Current) from 3/21/2023 in 8 West</th>
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<tbody>
<tr>
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</tr>
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<td>1258</td>
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<tr>
<td>3/23/2023</td>
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<td>1600</td>
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**Nursing Delirium Screening Scale-NuDESC (Adult Acute Care)**

- Disorientation
- Inappropriate Behavior
- Inappropriate Communication
- Illusions and Hallucinations
- Psychomotor Retardation
- NuDESC Score
- NuDESC Assessment

**Respiratory Interventions**

**Point of Care Tests**

- Blood Glucose Meter (Manual Entry)
  - 225
  - 250
- Blood Glucose Meter (Docked Result)
  - 225
- Hypoglycemia Interventions
- Blood Glucose Follow-up Monitoring
- Continuous Glucose Monitoring (Manual Entry)
  - CGM High Range: 270
  - CGM Low Range: 180
  - CGM and POCT Glucose Validation: Yes
  - Source of Validation Sample
Correlate Continuous Glucose Monitor with UVA Glucometer

Blood Glucose Meter (Manual Entry)
145

CGM and POCT Glucose Validation
Yes

Continuous Glucose Monitoring (Manual Entry)
130

CGM High Range
174

CGM Low Range
116

Glucose measurements used for insulin dosing must be checked with a hospital glucometer.
2. **DO** – Implement test of change
   - Nursing task went live on June 14\(^{th}\) 2022

3. **STUDY** – Observe and learn
   - Data 6 mo. before & after implementation
Percentage of CGM validation that occurred per the Clinical Practice Guideline criteria

- 25% (n=53) overall average pre intervention validation
- 40% (n=87) overall average post intervention validation
DESIGN

4. ACT – Determine modifications

- Repeat cycles as needed based on results
- Plan to sustain change
CGM validation at admission vs daily

July
Aug
Sept
Oct
Nov
Dec

Admission validation %
Daily validation %
FINANCIAL ANALYSIS

Financial impact of intervention to organization

• EHR build
• Data collection and interpretation
• Sustainability
ETHICAL ISSUES

Patient satisfaction

Respect for Autonomy

Nonmaleficence

Beneficence

Patient Safety

Regulatory Risk
## DIVERSITY EQUITY INCLUSION

### Table 1. Participant Characteristics

<table>
<thead>
<tr>
<th></th>
<th>Overall</th>
<th>NH Black</th>
<th>Hispanic</th>
<th>NH White</th>
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<tr>
<td><strong>N</strong></td>
<td>300</td>
<td>97</td>
<td>103</td>
<td>100</td>
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<table>
<thead>
<tr>
<th>Diabetes technology use</th>
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<tbody>
<tr>
<td>Insulin pump</td>
<td>129 (43%)</td>
<td>17 (18%)</td>
<td>40 (39%)***</td>
<td>72 (72%)<strong>,</strong></td>
</tr>
<tr>
<td>CGM</td>
<td>135 (45%)</td>
<td>27 (28%)</td>
<td>38 (37%)</td>
<td>70 (71%)<strong>,</strong></td>
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(Agarwal et al., 2021)
CONCLUSION - CDS

• CDS targeted at nursing processes can improve compliance with CPGs

• Contextual elements within EHR impact effectiveness of CDS
CONCLUSION – DIABETES TECHNOLOGY

• Validation of CGM supports patient self management and safe use of diabetes technology during hospitalization
ACKNOWLEDGEMENTS

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Dr. Clareen Wiencek
Dr. Richard Ridge
Laurie Brock
Questions?
REFERENCES


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• Type 1 Diabetes Index website. (n.d.). *Type 1 Diabetes in the United States*. https://www.t1dindex.org/countries/the-united-states/
