DEVELOPMENT OF A DIFFICULT VENOUS ACCESS PATHWAY
Disclosure

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3M, Bard, Baxter, BD, CareFusion, Cook Medical, Smiths Medical, Flo Medical

This presentation is independently prepared and reflects no commercial entity nor promotes particular products unless these are supported by research data.
Background

• Over 80% of patients coming to hospital will require some form of vascular access

• Nearly 60% will require a short PIVC.

• Needed for hydration, blood products, antibiotics and other therapies

• Typically the first invasive procedure attended when patients present to hospital

Background

• PIVCs have an under appreciated failure rate.…

• Up to 90% of PIVCs are prematurely removed or dislodge before they are due for removal!

• Complications include phlebitis (mechanical / chemical / infective), infiltration, occlusion and dislodgement


Background

One third of patients present with difficult access...

• Require multiple attempts at cannulation
• **Increased failure rates** compared to patients with good access –

**UP TO 50% of PIVCs FAIL WITHIN 24HRS**

• May need escalation to CVAD
Background

Main Reason: Increasing Chronicity and Acuity..

• Increased survival rates with chronic disease

• Patients present sicker

• Intensive care beds now a premium

• Sick patients pushed out onto wards

• Typically this cohort becomes harder to cannulate over time
Background

Consequences of difficult access:

• Multiple painful attempts (sometimes severe pain)

• Delay in treatment / diagnosis

• Increased risk of phlebitis and thrombosis

• Increased risk of infection

• Increased length of stay


Background

Difficult access leads to premature failure of PIVC:

- PIVC then requires re-siting
- Further painful attempts
- Increased anxiety of patient
- Eventual venous depletion from multiple attempts
- Needing CICC vs PICC
Background

In my hospital:

• Increasing patients with difficult access

• Medical / Nursing teams unable to cannulate

• Anaesthetics unable to cannulate in a timely fashion

• Patients presenting for PICCs after multiple cannulation attempts - (20-30 attempts)

• Unable to insert PICC due to extensive bruising / thrombosis – CVC inserted
We Needed To Do Something
Enter.... DiVA
Difficult intraVenous Access Pathway
DiVA Pathway incorporated our ‘5 Rights’

• The **RIGHT trained clinician** (credentialed, has procedural load) inserts…

• The **RIGHT device** (length of dwell, infusate characteristics) into…

• The **RIGHT vessel** (after vascular assessment) for…

• The **RIGHT patient** (clinical assessment, allergies, coags, GFR etc.) at…

• The **Right time** (early intervention for timely treatment)…
DiVA Development with Ultrasound Training

Ultrasound Guidance:

• US has become standard practice for CVADs

• Can mitigate many procedural risks

• US for PIVCs is emerging as acceptable practice - machines getting cheaper / more accessible

• US guidance by an experienced user can have a 4 fold increase in cannulation success

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DiVA Development with Ultrasound Training

Ultrasound Training:

• Incorporated After Hours Clinical Support Team and select Junior Medical Officers

• Completed theory booklet:
  - Vascular anatomy and assessment
  - Aseptic technique
  - Ultrasound principles

• Practical training and 5-15 supervised ultrasound guided procedures
DiVA Pathway – 24hr cover

• Business Hours:  
  1. Admitting Team Registrar  
  2. Duty Anaesthetist  
  3. Central Venous Access Service

• After Hours:  
  1. Ward Senior  
  2. After Hours Clinical Support Team  
  3. Duty Anaesthetist  
  4. ICU for urgent Central Access
Nursing staff empowered in policy to initiate referrals for CVAD/Midline after identifying DiVA patient and discussing with treating team.
IV Decision Tool Incorporating DiVa

Intravenous (IV) Cannulation Device Selection

Peripheral Access Good? (Three suitable sites or more)

- Medication or solution not listed as irritant or vesicant (Can be administered through peripheral veins)
- Osmolality of solution less than 600mOsm / L (E.g. 0.9% Sodium Chloride, Hartmann’s Solution or 5% Glucose)

Patient Requires Central Venous Access Device (CVAD)

Expected Duration

Poor IV Access?
- Two suitable sites or less?
- No veins visible or palpable?
- Multiple failed cannulation attempts?
- See Difficult Intravenous Access (DiVA) Pathway

Less than 7 days?
- Maintain by Intravenous Peripheral Cannula

Greater than 7 days?
- If less than 7 days duration, consider ultrasound-guided Peripheral Intravenous Cannula – refer to DiVA Pathway

Between 7 days - 4 weeks?
- Consider Midline Catheter or Peripherally Inserted Central Catheter (PICC)

Duration greater than 4 – 6 weeks?
- Consider Tunnelled Catheter (Tunelled PICC / CVC / Hickman) or Implanted Port

Up to 3 months
- If greater than 6 weeks
- Consider Tunnelled Catheter (Tunelled PICC / CVC / Hickman) or Implanted Port

Greater than 3 months
- PowerChart Order
- Contact Central Line Service for consult: 88688 or Pager 48886
- Document all IV Cannulation insertions and removals on PowerChart
DiVA Pathway Effect

• First Year 2016:
  369 patients had USG PIVs after hours
  200 patients referred to central venous access service during hours

• Second Year 2017:
  Close to 1000 patients referred after hours
  Close to 400 patients referred during hours

• Significant number of patients now receiving extended dwell PIVs or midlines through central line service (25% of service workload)
### Table 1: Characteristics of patients referred to after-hours clinical support team

<table>
<thead>
<tr>
<th></th>
<th>Males (n = 165)</th>
<th>Females (n = 214)</th>
<th>Combined (n = 379)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (y), mean (SD)&lt;sup&gt;a&lt;/sup&gt;</td>
<td>67 (16)</td>
<td>66 (18)</td>
<td>66 (17)</td>
<td>0.92</td>
</tr>
<tr>
<td>Height (cm), mean (SD)</td>
<td>170 (8.5)</td>
<td>159 (8.0)</td>
<td>164 (9.6)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Weight (kg), median (IQR)</td>
<td>80 (68,100)</td>
<td>72 (56, 85)</td>
<td>75 (60, 90)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td><strong>BMI</strong> (kg/m&lt;sup&gt;2&lt;/sup&gt;), median (IQR)</td>
<td><strong>28 (24, 34)</strong></td>
<td><strong>28 (22, 33)</strong></td>
<td><strong>28 (23, 34)</strong></td>
<td><strong>0.620</strong></td>
</tr>
<tr>
<td>[BMI range, max - min]</td>
<td>[14.7–80.6]</td>
<td>[15.1–70.3]</td>
<td>[14.7–80.6]</td>
<td></td>
</tr>
<tr>
<td>Specialty, n (%)</td>
<td></td>
<td></td>
<td>0.730</td>
<td></td>
</tr>
<tr>
<td>Medical</td>
<td>71 (43)</td>
<td>82 (38)</td>
<td>153 (40)</td>
<td></td>
</tr>
<tr>
<td>Surgical</td>
<td>38 (23)</td>
<td>58 (27)</td>
<td>96 (25)</td>
<td></td>
</tr>
<tr>
<td>Haematology/Oncology</td>
<td>23 (14)</td>
<td>27 (13)</td>
<td>50 (13)</td>
<td></td>
</tr>
<tr>
<td>ICU/CCU&lt;sup&gt;f&lt;/sup&gt;</td>
<td>24 (14)</td>
<td>23 (11)</td>
<td>47 (12)</td>
<td></td>
</tr>
<tr>
<td>Aged care</td>
<td>6 (4)</td>
<td>17 (8)</td>
<td>23 (6)</td>
<td></td>
</tr>
<tr>
<td>Maternity</td>
<td>0</td>
<td>3 (1)</td>
<td>3 (1)</td>
<td></td>
</tr>
<tr>
<td>Paediatrics</td>
<td>1 (1)</td>
<td>1</td>
<td>2 (1)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>2 (1)</td>
<td>3 (1)</td>
<td>5 (1)</td>
<td></td>
</tr>
<tr>
<td>Previous attempts, median (IQR)&lt;sup&gt;d&lt;/sup&gt;</td>
<td>3 (2, 4)</td>
<td>2 (2,4)</td>
<td>2 (2,4)</td>
<td>0.780</td>
</tr>
<tr>
<td>[Range, max – min]&lt;sup&gt;e&lt;/sup&gt;</td>
<td>[1, 10]</td>
<td>[1, 10]</td>
<td>[1, 10]</td>
<td></td>
</tr>
<tr>
<td>Pain score (0–10) during last attempt, median (IQR)</td>
<td>6 (4,8)</td>
<td>7 (6, 10)</td>
<td>7 (5, 9)</td>
<td>0.130</td>
</tr>
<tr>
<td>[Range, max - min]</td>
<td>[2, 10]</td>
<td>[3, 10]</td>
<td>[2, 10]</td>
<td></td>
</tr>
</tbody>
</table>
### Table 2 Characteristics of after-hours clinical support team interventions

<table>
<thead>
<tr>
<th>Indication for PIVC*, n (%)</th>
<th>Males (n = 165)</th>
<th>Females (n = 214)</th>
<th>Combined (n = 379)</th>
<th>p-value</th>
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<tbody>
<tr>
<td>Medications/Fluids</td>
<td>118 (72)</td>
<td>166 (78)</td>
<td>284 (75)</td>
<td>0.240</td>
</tr>
<tr>
<td>CT contrast</td>
<td>8 (5)</td>
<td>12 (6)</td>
<td>20 (5)</td>
<td></td>
</tr>
<tr>
<td>Medical Emergency</td>
<td>2 (1)</td>
<td>2 (1)</td>
<td>4 (1)</td>
<td></td>
</tr>
<tr>
<td>Blood transfusion</td>
<td>7 (4)</td>
<td>2 (1)</td>
<td>9 (2)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>30 (18)</td>
<td>32 (15)</td>
<td>62 (16)</td>
<td></td>
</tr>
<tr>
<td>Insertion site, n (%)</td>
<td></td>
<td></td>
<td></td>
<td>0.560</td>
</tr>
<tr>
<td>Basilic</td>
<td>109 (66)</td>
<td>153 (71)</td>
<td>262 (69)</td>
<td></td>
</tr>
<tr>
<td>Cephalic</td>
<td>16 (10)</td>
<td>18 (8)</td>
<td>34 (9)</td>
<td></td>
</tr>
<tr>
<td>Medial cubital</td>
<td>22 (13)</td>
<td>22 (10)</td>
<td>44 (12)</td>
<td></td>
</tr>
<tr>
<td>Antecubital</td>
<td>14 (8)</td>
<td>16 (7)</td>
<td>30 (8)</td>
<td></td>
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<tr>
<td><strong>Device gage, n (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20 g PIVC</td>
<td>92 (56)</td>
<td>127 (59)</td>
<td>219 (58)</td>
<td>0.400</td>
</tr>
<tr>
<td>20 g midline</td>
<td>1 (1)</td>
<td>0 (0)</td>
<td>1 (1)</td>
<td></td>
</tr>
<tr>
<td>18 g PIVC</td>
<td>56 (34)</td>
<td>66 (31)</td>
<td>122 (32)</td>
<td></td>
</tr>
<tr>
<td>18 g midline</td>
<td>0 (0)</td>
<td>1 (1)</td>
<td>1 (1)</td>
<td></td>
</tr>
<tr>
<td>22 g PIVC</td>
<td>11 (7)</td>
<td>8 (4)</td>
<td>19 (5)</td>
<td></td>
</tr>
<tr>
<td>24 g PIVC</td>
<td>0 (0)</td>
<td>2 (1)</td>
<td>2 (1)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>5 (3)</td>
<td>7 (3)</td>
<td>12 (4)</td>
<td></td>
</tr>
<tr>
<td><strong>First attempts success (%)</strong></td>
<td>153 (95)</td>
<td>195 (92)</td>
<td>348 (93)</td>
<td>0.240</td>
</tr>
<tr>
<td><strong>No. of attempts, median (IQR)^c</strong></td>
<td>1 (1,1)</td>
<td>1 (1,1)</td>
<td>1 (1,1)</td>
<td>0.100</td>
</tr>
<tr>
<td>(Range, min – max)^d</td>
<td>[1, 2]</td>
<td>[1, 2]</td>
<td>[1, 2]</td>
<td></td>
</tr>
<tr>
<td><strong>Pain score, median (IQR)^c</strong></td>
<td>2 (1, 3)</td>
<td>1 (1,3)</td>
<td>2 (1,3)</td>
<td>0.600</td>
</tr>
<tr>
<td>(Range, min – max)^b</td>
<td>[1–7]</td>
<td>[0–8]</td>
<td>[0–8]</td>
<td></td>
</tr>
<tr>
<td><strong>Procedural time in minutes, mean (SD)^a</strong></td>
<td>13.6 (5.3)</td>
<td>13.7 (6.4)</td>
<td>13.6 (6.0)</td>
<td>0.850</td>
</tr>
</tbody>
</table>
USG PIVCs inserted After Hours 2016

Table 3 Comparison of cannulation attempts and pain score prior

<table>
<thead>
<tr>
<th></th>
<th>Prior to referral</th>
<th>AHCST(^a) referral</th>
<th>(p)-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of attempts, median (IQR)(^b)</td>
<td>2 (2, 4)</td>
<td>1 (1, 1)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Pain score, median (IQR)</td>
<td>7 (5, 9)</td>
<td>2 (1, 3)</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>

30% of patients had 4 or more attempts prior to USGPIVC referral

40% of patients experienced 8/10 pain or more with non USGPIVC attempts
DiVA Pathway Effect

In Summary:

• DiVα pathway provides clinical staff with a solution to obtain IV access in difficult patients

• Guides thinking towards the most appropriate device for DiVA patients

• Reduced multiple cannulation attempts

• Allows timely referral for Central Venous Access when required
Questions?