MMed Thesis Presentation

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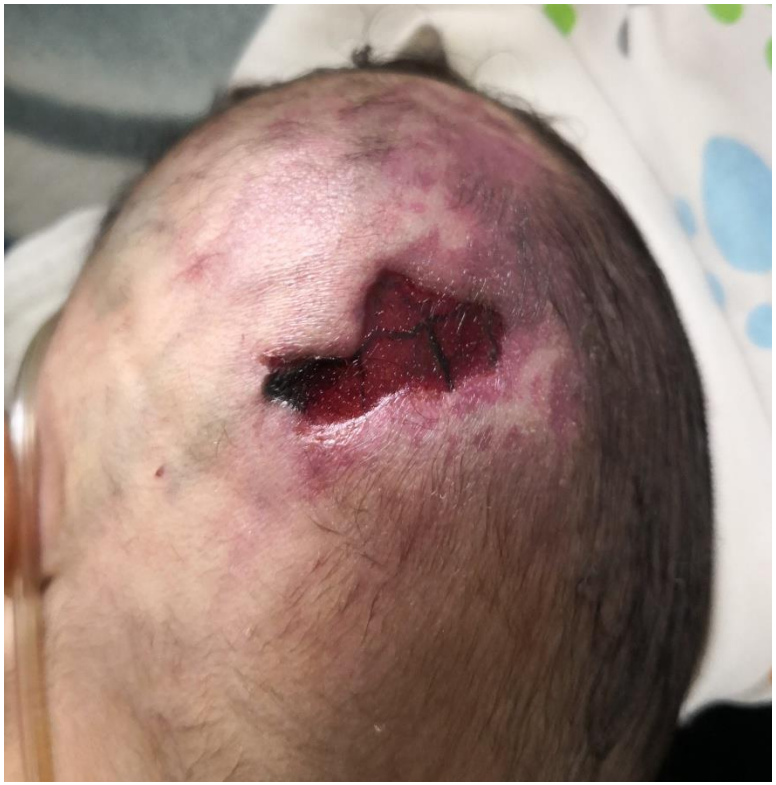
MMed II candidate 2021

Peripheral intravenous cannula complications in children admitted to Port Moresby General Hospital: a prospective, observational study.



Introduction

- Insertion of peripheral intravenous cannulas (PIVCs) is one of the most common procedures performed in hospitalised patients.
- More than 80% of patients undergo this procedure.
- PIVCs are inserted for several reasons
- Complications can arise from PIVC use, of which phlebitis is the most common

- Risk factors for PIVC complications include
  - Use of drugs that have vesicant or pro-thrombotic properties
  - the number of PIVC used
  - the duration of intravenous (IV) treatment;
  - PIVC gauge;
  - inadequate dressing
  - insertion site at the antecubital fossa;

To our knowledge, there are no published studies on the complications of PIVCs in children in Papua New Guinea.

Aim

To determine the type and frequency of complications associated with PIVC use in children admitted to Port Moresby General Hospital (PMGH).

Methodology

Study design

- This was a prospective, observational study.

Study Site

- Paediatric department of the PMGH

Study duration

- Data collection period: 2/6/2020 – 30/10/2020

Population and Sample size

- The study population comprised all admitted paediatric patients who met the inclusion criteria. 104 patients were recruited for the study.

Inclusion criteria

- All children from eight days old to thirteen years old who were admitted to the general paediatric wards.

Exclusion criteria

- Referred patients with an existing PIVC in situ,
- Patients who had had IV treatment at CED for >24 hours before admission, and
- Neonates admitted to the special care nursery (SCN)

Recruitment and Data collection

- Convenient sampling was used to recruit the patients.
- A structured data collection form was used to gather the data.
- Patients were followed up daily until discharged, or until their PIVCs were removed.
  - Each PIVC site was inspected for swelling, redness, necrosis and leaking; the PIVC site was also palpated for pain.

Safety considerations within the study

- All PIVCs that developed a complication and were noted by the primary researcher during daily follow up were removed.

Outcomes

- Primary outcome: the incidence of complications associated with PIVC use.
- Secondary outcome: identify risk factors for developing a PIVC complication.

Data Analysis

- The data were analysed using Epi Info version 7.
- Percentages and absolute frequency were calculated for categorical data.
- For quantitative data, the mean and standard deviation were calculated.
- Odds Ratios, 95% CI and *p*-values were calculated using Open Epi.
- A *p* value <0.05 was considered significant.

Results

Figure 1. Patient flow during study period

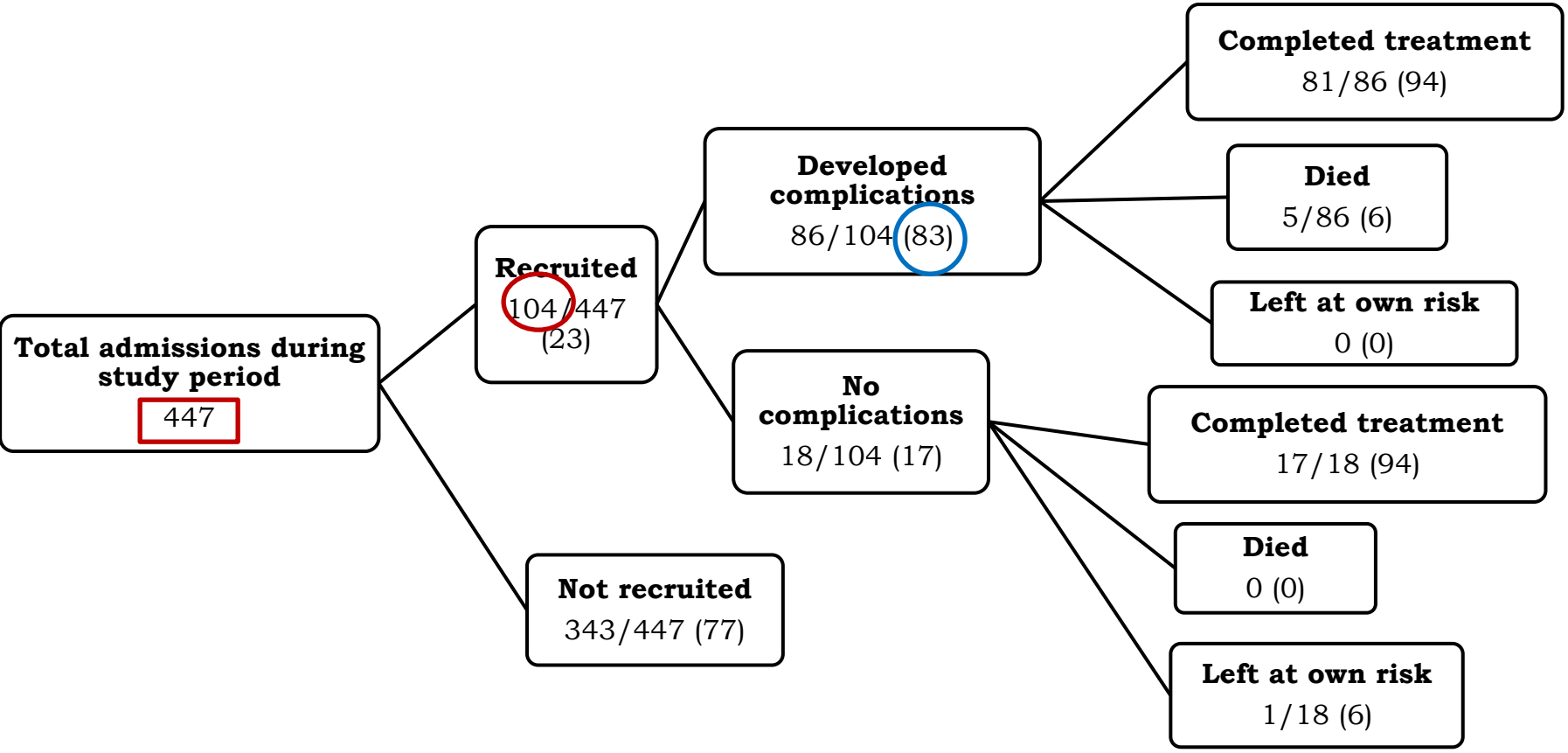


Table 1. Age and gender distribution of study participants. n = 104.

	n	(%)
Sex		
Male	53	51
Female	51	49
Age		
< 29 days	10	10
29 days – 1 year	50	48
> 1 year – 5 years	27	26
>5 years	17	16
Range	0.02 – 12.58	

Table 2. Diagnosis and number of co-morbidities of study participants

Diagnosis (n = 194)	**n**	**%**
Malnutrition	33	17
Acute lower respiratory tract infection	24	12
Acute gastroenteritis	20	10
Tuberculosis	15	8
Human immunodeficiency virus infection	12	6
Neonatal sepsis	11	6
Dehydration	10	5
Acute bacterial meningitis	9	5
Skin infections	8	4
Anaemia	7	4
Congenital heart disease	7	4
Persistent gastroenteritis	7	4
Electrolyte imbalance	4	2
Cerebral palsy	3	2
Sepsis	3	2
Others	21	10.5
Number of co-morbidities (n =104)		
0	47	45
1	34	33
≥2	23	22


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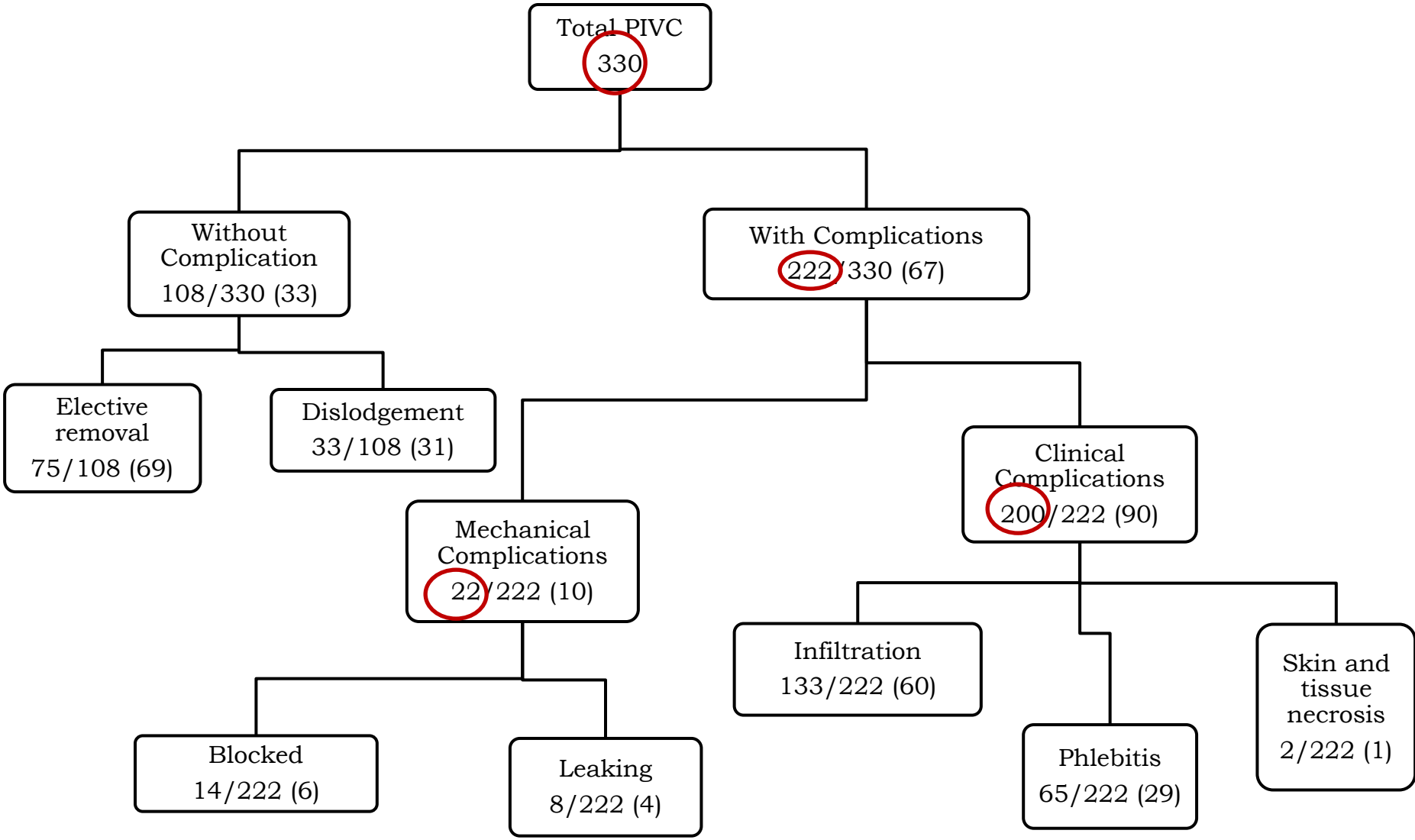
Table 3. Characteristics of inserted PIVCs, sites of insertion, type of plaster used, PIVC lifespan and PIVC outcome.

PIVCs inserted	**n**	**(%)**
Total	330	
Mean (SD)	3.17±1.89	
Range	1 - 11	
PVC Gauge		
20 FG (pink)	2	1
22 FG (blue)	112	35
24 FG (yellow)	164	50
26 FG (purple)	52	16
Site of insertion		
Dorsum of foot	33	10
Ankle	46	14
Dorsum of hand	32	10
Wrist	176	53
Forearm	16	5
Antecubital fossa	20	6
Others	7	2
Plaster used to secure PIVC		
AcoPore with reinforced gauze bandage	0	0
AcoPore without reinforced gauze bandage	22	7
Leukoplast with reinforced gauze bandage	5	1
Leukoplast without reinforced gauze bandage	240	73
Mediplast with reinforced gauze bandage	4	1
Mediplast without reinforced gauze bandage	27	8
Tensoplast with reinforced gauze bandage	0	0
Tensoplast without reinforced gauze bandage	32	10

Table 3… Continued

	n	(%)
PIVC lifespan (days)		
0	38	11
1	119	36
2	111	34
3	36	11
4	16	5
≥5	10	3
Mean	1.72	
Range	0 – 7	
PIVC outcome		
Developed complication	222	67
No complication	108	33

Figure 2. Outcomes of the 330 PIVCs. Numbers in brackets are percentages.



Risk factors for developing a PIVC complication

- Patients were more likely to develop complications with a larger gauge PIVC
- Compared to size 24 FG PIVC, children with size 22 FG PIVC were 2.06 times more likely to develop a complication (95% CI: 1.20 – 3.60; p = 0.012)
- Patients were 2.55 times more likely to develop a complication with a size 22 FG PIVC compared to a size 26 FG (95% CI: 1.24 – 5.19; p = 0.016)
- Regarding clinical complications, children with size 22 FG PIVCs were 3.26 times more likely to develop one compared to size 26 FG PIVC ([79/33 vs. 22/30 (95% CI:1.64 – 6.50; p = 0.0007)].

Discussion

- The incidence of complications per patient with one or more PIVCs was 83%.
  - Approximately 2.5 times higher than the 34% found by a recent systematic review and meta-analysis of 32 studies done on paediatric patients [12].
- Similarly, the incidence of complications per PIVC inserted was higher (67%) compared to other studies on paediatric populations which reported incidences of 16% - 51.9% [4,7,8,13-15].

Clinical complications

- Infiltration
  - comprised 60% of the complications. This was higher compared to the 10% - 32.7% found in 6 other studies [7,8,12,14,15,17].
- Phlebitis
  - Second most common with 29%. This was lower than the 71.25% found by Nagpal *et al* [21], but higher than the incidence found in five other studies on paediatric patients [6-8,12,17].
  - The incidence is approximately 6 times higher than the Infusion Nurse Society's recommended benchmark rate of no more than 5% [22].
- Skin necrosis.
  - Two cases
  - Ben Abdelaziz *et al* noted one case of skin necrosis [7].
  - Other studies did not mention it as a complication of PIVC use [8,13-15].

Mechanical Complications

- Obstruction
  - Commonest complication, with an incidence of 6%. Indarwati *et al* also noted a 6% incidence of PIVC obstruction [12].
  - Four other studies reported incidences of obstruction greater than the one we found [4,8,14,15].
- Leaking
  - made up 4% of the complications
  - Only one other study reported leaking as a PIVC complication [12].

Factors contributing to PIVC complications

- Only significant factor: PIVC gauge; the bigger the PIVC gauge the greater the risk.
- Non-significant factors included:
  - Age
  - Gender
  - Undernourishment
  - PIVC insertion site
  - IV infusion method, IV fluid type and IV fluid rate
  - Number of drugs administered
  - PIVC indwell time,
  - combined administration of both IV fluids and drugs
  - Number of PIVCs inserted

- There was no documentation of
  - Time of PIVC insertion
  - Site of initial insertion
  - Time of PIVC removal
  - Reason for removal of initial PIVC
  - Number of attempts at reinsertion
  - Site of reinsertion

Limitations

1. Missing data from the patients' charts.
2. Primary researcher was ill during data collection.
3. COVID-19 pandemic affected patient recruitment.
4. Post-PIVC removal phlebitis could not be determined as patients were not followed up post PIVC removal
5. PIVCs were inserted by different cadres of health workers. This might affect PIVC lifespan and development of complications.
6. There were patients admitted during the study period who had PIVC complications that were not included in the study due to convenient sampling being used to recruit patients. The complication rate would have been much higher had they been included.

Conclusion

- The incidence of PIVC complications in the paediatric department of PMGH is high.
- Large PIVC gauge is a significant risk factor for developing complications.
- It is the responsibility of the clinical team to ensure that the PIVC is working well, to observe it closely for the development of complications, and to ensure it is not left in situ unnecessarily.

Acknowledgement

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- Paediatric Team – Port Moresby General Hospital
- The management of Port Moresby General Hospital

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Thank you all

Any...

- Comments??
- Questions??
- Critiques??