

OMG – What is going wrong with PIVCs and how can we fix it?

Claire Rickard RN PhD
Principal Director, AVATAR group
Menzies Health Institute Queensland,
Professor, School of Nursing & Midwifery

© 2018 BD. BD and the BD Logo are trademarks of Becton, Dickinson and Company.





Alliance for Vascular Access Teaching And Research

[HOME](#)

[OUR WORK](#)

[GET INVOLVED](#)

› [About Us](#)

› [Our Team](#)

› [Chapters](#)

› [Events](#)

› [Newsletters](#)

› [Our Sponsors](#)

› [Contact Us](#)

Welcome to the AVATAR Group

Making vascular access complications history!

Many vascular access devices are painful and difficult to insert. Studies show that 25% to 50% then fail due to infection, blockage, dislodgement or blood vessel damage.

Our goal is to make vascular access complications history.

The AVATAR Group undertakes committed scientific work to improve hospital and home care practices, to rigorously and independently test new products, and to promote global networks of vascular access researchers.

We strive to eliminate ineffective practices and replace them with innovative solutions, providing patients with a better healthcare experience, and saving global healthcare providers hundreds of millions of dollars.

www.avatargroup.org.au [Twitter @avatar_grp](#) [Facebook: @avatargroup4111](#) [Newsletter](#) [Blog](#)



Vascular Access



PIVC complications



PIVC failure in the adult population:
a systematic review (under review).
Marsh N et al.



92 studies, 64 observational, 28 RCTs

75,433 participants

Overall failure 36%

PIVCs

Complication	Studies (PIVCs)	%
Phlebitis	77 (62,294)	16%
Infiltration	40 (24,919)	12%
Occlusion	31 (32,672)	8%
Pain	23 (18,070)	7%
Leakage	17 (9,339)	7%
Dislodgment	36 (18,425)	6%
Local infection	11 (13,884)	0.7%
CRBSI	12 (14,954)	<0.1%

PIVC failure in the adult population: a systematic review (under review) Marsh N et al.

PEDIATRICS. 2015. Ullman A et al.

Complications of Central Venous Access Devices: A Systematic Review

Amanda J. Ullman, RN, MAppSci^{1,2,3,4}, Nicole Marsh, RN, MAccPrac^{1,2,3}, Gabor Mihala, MEng, GCert(Biostat)^{1,2}, Marie Cooke, RN, PhD^{1,2,3}, Claire M. Rickard, RN, PhD^{1,2}

CONTEXT: The failure and complications of central venous access devices (CVADs) result in interrupted medical treatment, morbidity, and mortality for the patient. The resulting insertion of a new CVAD further contributes to risk and consumes extra resources.

abstract

OBJECTIVE: To systematically review existing evidence of the incidence of CVAD failure and complications across CVAD types within pediatrics.

DATA SOURCES: Central Register of Controlled Trials, PubMed, and Cumulative Index to Nursing and Allied Health databases were systematically searched up to January 2015.

STUDY SELECTION: Included studies were of cohort design and examined the incidence of CVAD failure and complications across CVAD type in pediatrics within the last 10 years. CVAD failure was defined as CVAD loss of function before the completion of necessary treatment, and complications were defined as CVAD-associated bloodstream infection, CVAD local infection, dislodgement, occlusion, thrombosis, and breakage.

DATA EXTRACTION: Data were independently extracted and critiqued for quality by 2 authors.

RESULTS: Seventy-four cohort studies met the inclusion criteria with mixed quality of reporting and methods. Overall, 25% of CVADs failed before completion of therapy (95% confidence interval [CI] 20.9%–29.2%) at a rate of 1.97 per 1000 catheter days (95% CI 1.71–2.23). The failure per CVAD device was highest proportionally in hemodialysis catheters (46.4% [95% CI 29.6%–63.6%]) and per 1000 catheter days in umbilical catheters (28.6 per 1000 catheter days [95% CI 17.4–39.8]). Totally implanted devices had the lowest rate of failure per 1000 catheter days (0.15 [95% CI 0.09–0.20]).

LIMITATIONS: The inclusion of nonrandomized and noncomparator studies may have affected the robustness of the research.

CONCLUSIONS: CVAD failure and complications in pediatrics are a significant burden on the health care system internationally.



¹School of Nursing and Midwifery and ²School of Medicine, Griffith University, Queensland, Australia; ³National Health and Medical Research Council, Centre of Research Excellence in Nursing and Centre for Health Practice Innovation, ⁴Alliance for Vascular Access Training and Research Group, and ⁵Centre for Applied Health Economics, Menzies Health Institute, Queensland, Australia; and ⁶Centre for Clinical Nursing, Royal Brisbane and Women's Hospital, Queensland, Australia

Ms Ullman conceptualized and designed the study, carried out the initial analysis, and drafted the initial manuscript. Ms Marsh assisted with the acquisition of data and critically reviewed the manuscript. Mr Mihala carried out the subsequent analysis. Drs Cooke and Rickard assisted with the conception and design of the study. Mr Mihala and Drs Cooke and Rickard assisted with the interpretation of the data and reviewed and revised the manuscript, and all authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

www.pediatrics.org/cgi/doi/10.1542/peds.2015-1007

DOI: 10.1542/peds.2015-1007

Accepted for publication Aug 5, 2015

Address correspondence to Amanda Ullman, School of Nursing and Midwifery, Griffith University, N48 Kessels Road, Nathan, Queensland, 4111, Australia.
E-mail: a.ullman@griffith.edu.au

PEDIATRICS (ISSN Numbers: Print 0031-4005, Online, 1098-4275).

CVAD failure
average 25%



CVAD complications

Complication	Studies (CVADs)	%
Suspected infection	19 (9306)	17%
Occlusion	5 (807)	11%
Thrombosis	22 (7224)	10%
Dislodgement	16 (4934)	2%
CLABSI	14 (20,297)	2%
Local infection or phlebitis	7 (2044)	1%

Takashima M et al, Critical Care Medicine 2018 Complication and Failures of Central Vascular Access Device in Adult Critical Care Settings

The economic burden of vascular access devices in public hospitals in Queensland.

Australian Health Review, 2018. Tuffaha H et al.

- Population 4.7 million (Chile 18 million)
- 2.75 million VADs/year in public hospitals
- 2.69 million (98%) PIVCs – $\frac{3}{4}$ inserted successfully
- 60,000 CVCs – $\frac{4}{5}$ inserted successfully
- Cost \$59 million (\$10 million products)



In my 900 bed hospital each year

One or more of

- Dislodge 13,500
- Phlebitis 25,500
- Occlusion 37,500

200,000 purchased

150,000

88,500 removed at end of treatment

50,000 Failed insertion

Primary BSI

60

12

SAB

105

Local infection

Rickard et al. Lancet 2018



But – does my hospital know it has these problems??

- The problems we have

- Failed insertions
- Phlebitis
- Occlusion
- Dislodgement
- Thrombosis
- Infiltration, extravasation
- Local & bloodstream infections
- **PIVCs**
- **Central venous catheters**

- The problems we measure

- CLABSI
 - Only one problem measured
 - In only one device type

My hospital ~1000 CLABSI/ year

***But ~ 112,000 PIVC and
~13,000 CVC problems each year***

- why don't we measure these?

“If you can't measure it, you can't improve it”
Peter Drucker



How many KPIs do we want?



Vascular access specialist



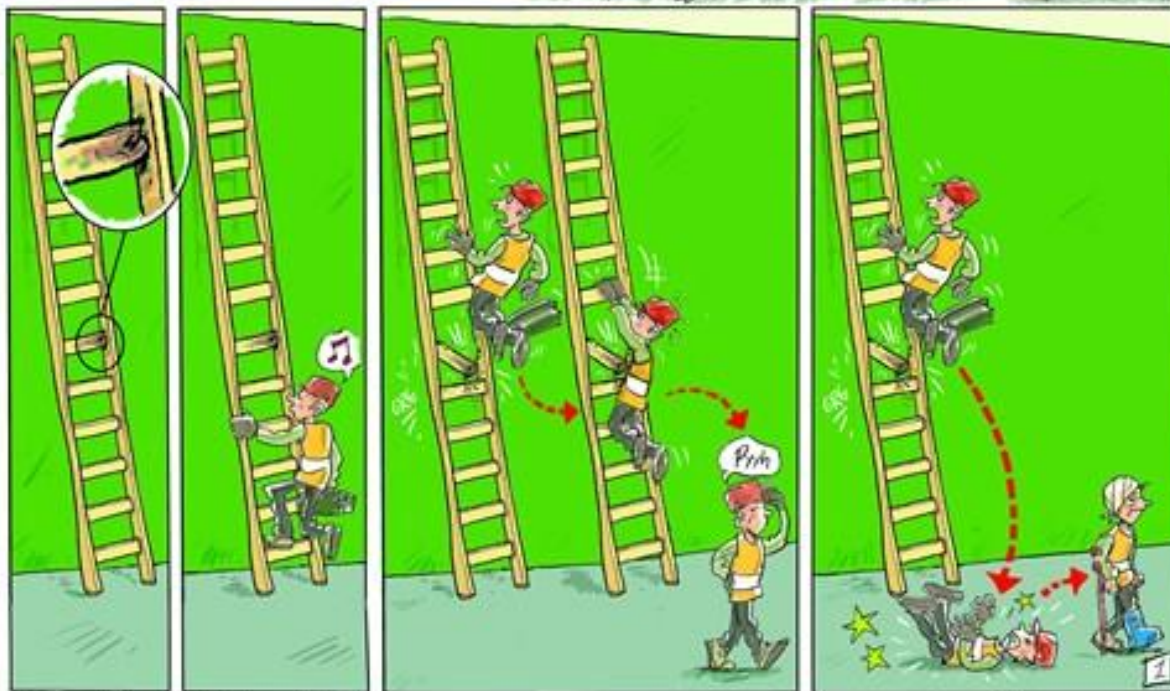
Hospital Executive

What KPIs should we collect?

What can we learn from other industries?



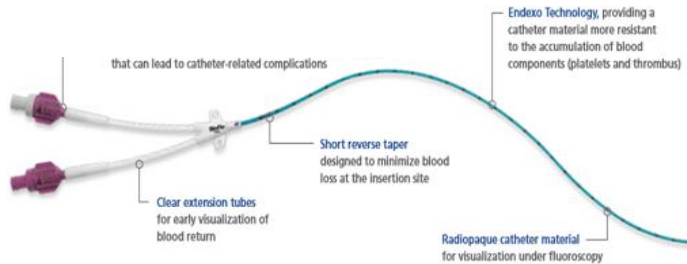
The broken ladder



Poor dressing -> Bloodstream Infection -> Death

Quality measures can be:

- Outcome KPI – collect at/soon after catheter removal
 - Pull charts/EMR
- Process KPI – collect at any time during dwell
 - Audit inpatients



Device choice

Removal

Insertion

Function

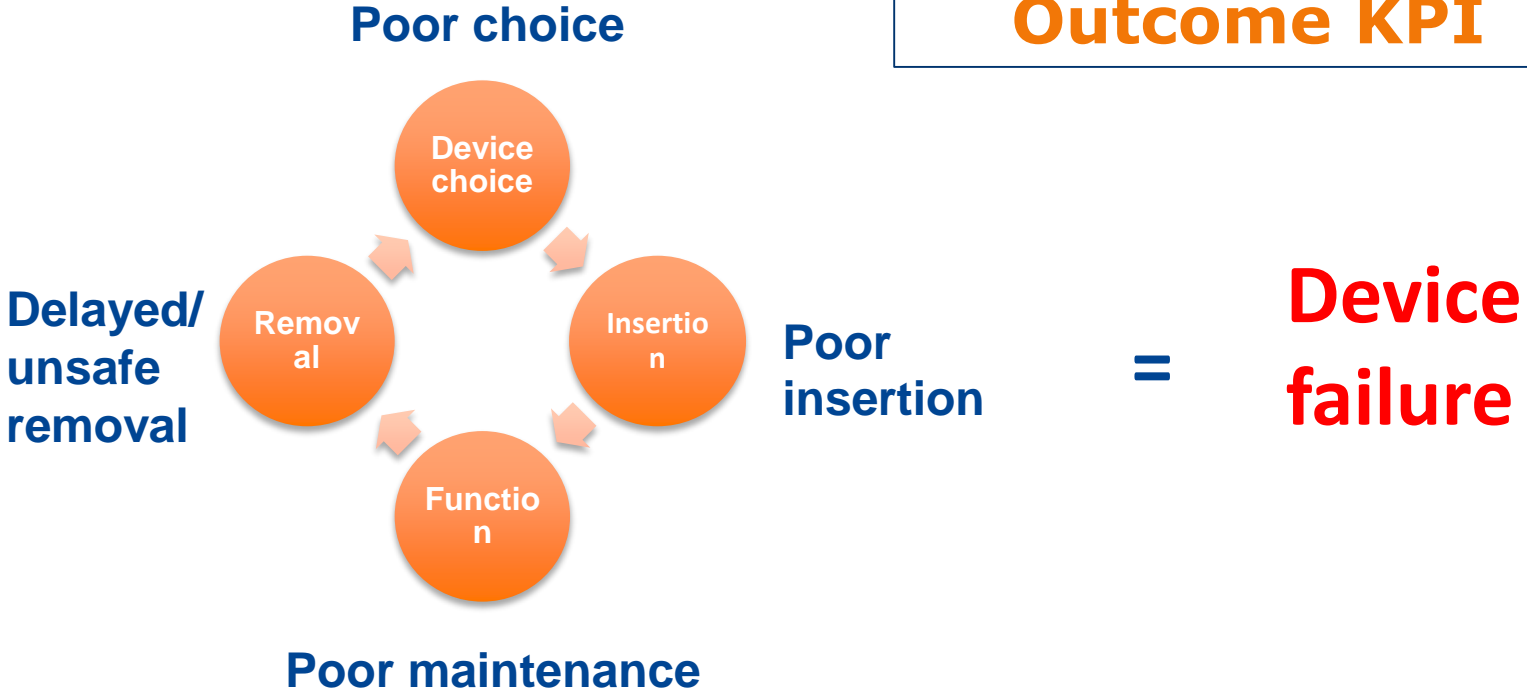


What do we want?

1. Inserted on the first attempt
 2. Keeps working and no infection
 3. Comfortable for the patient
 4. Patient engaged in care
 5. Removed when therapy complete
- Documented in medical record



Outcome KPI



Device Failure – PIVCs

- Any complication at removal

Device Failure – CVADs

- Any complication at removal

+ plus

- Reversible complications during dwell

Device Failure – PIVCs

- Phlebitis, Pain
- Occlusion
- Infiltration, Extravasation
- Dislodgement, Leaking
- Primary BSI
- Local infection

Device Failure – CVADs

- Thrombosis, Pain
- Reversible/Non-reversible Occlusion or Fracture
- Infiltration, Extravasation
- Dislodgement, Leaking
- Dislodgement
- Primary BSI
- Local infection

KPI: Device Failure

Now

- PIVC – 36%
- CVAD – 25%

Benchmark

- PIVC – 10%
- CVAD – 5%

Patient centred care

- Patient Reported Outcome Measures – PROMs
 - Pain
 - Anxiety
- Patient Reported Experience Measures – PREMs
 - Multiple attempts at IV cannulation

Walton et al BMJ Safety & Quality 2017

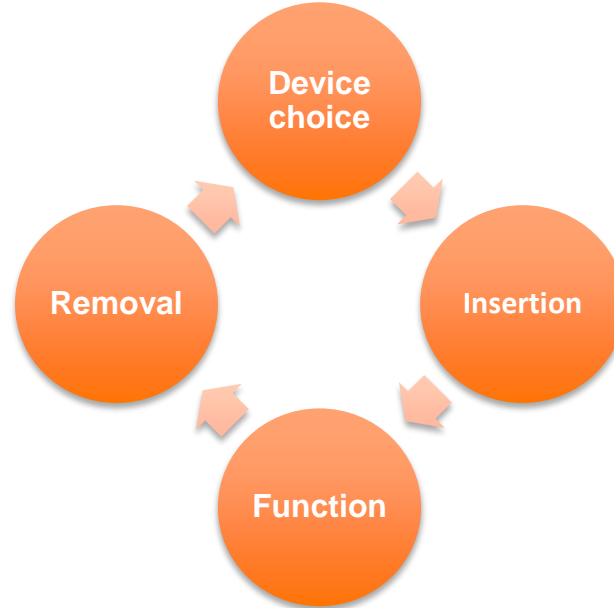
- Communication by inserter

Larsen et al Brit J Nurs 2017



Outcome KPIs

3. Device Failure



1. PREM – Multiple insertion attempts

2. PROM - Pain

Process KPIs

What predicts failure?

Process KPI: Device Selection

- Peripherally compatible medication – Yes or No

Process KPI: Device Insertion

- Aseptic insertion – Yes or No
 - Hand hygiene performed,
 - ANTT
 - Hair clipped on hirsute patients
 - Skin decontamination CHG in alcohol, allowed to dry
 - Sterile dressing applied

Device Maintenance KPI



I-DECIDED™ INSTRUMENTO DE
EVALUACIÓN & DECISIÓN IV

Device Removal KPI

Clinical monitoring, documentation and decision making tool
Replaces VIP, INS tools



Dr Gillian Ray-Barruel
g.ray-barruel@griffith.edu.au



I-DECIDED™ INSTRUMENTO DE EVALUACIÓN & DECISIÓN IV

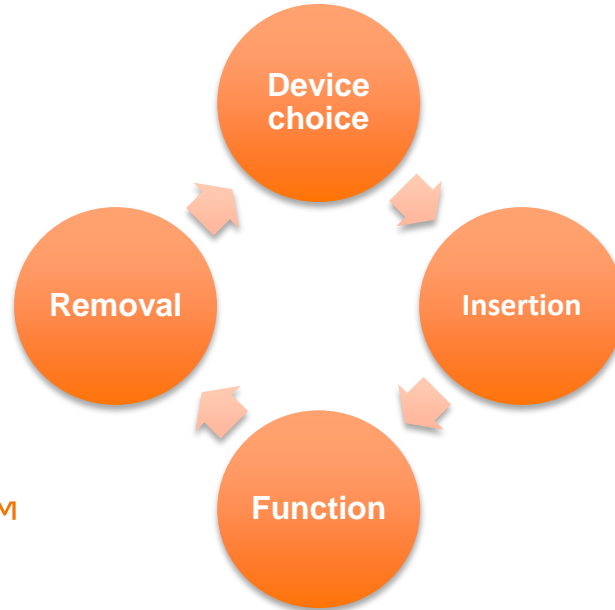
- | | |
|----------|--|
| I | IDENTIFICAR Si el paciente tiene un catéter IV. |
| D | ¿EL DISPOSITIVO IV ES NECESARIO? Considere la retirada si no se utilizó en las últimas 24 horas, o es improbable su uso en las siguientes 24 horas. Considere el cambio a medicamentos orales. |
| E | ¿EFECTIVO funcionamiento? Siga las recomendaciones de la institución sobre la verificación y el mantenimiento de la permeabilidad. |
| C | ¿COMPLICACIONES en el sitio de inserción IV? Dolor $\geq 2/10$, enrojecimiento, edema, fuga, infiltración, extravasación, endurecimiento, cordón venoso palpable o purulencia |
| I | INFECCIÓN prevención Higiene de manos. Realizar antisepsia de las conexiones & permitir secar. Uso cuidadoso de los dispositivos de administración. |
| D | DETERMINAR CURACIÓN & sujeción. Curación limpia, seca e intacta. Catéter IV y tubuladuras aseguradas. |
| E | EDUCAR & EVALUAR. Discutir el plan de cuidado IV con el paciente y la familia |
| D | DOCUMENTAR su decisión. Mantener, cambiar la curación, o quitar el catéter IV.
Siempre considere la política de su institución y consulte a el equipo y el paciente, según necesidad. |

1. Peripherally compatible meds

KPIs

3. Device Failure

3. I-DECIDED™



1. PREM – Multiple insertion attempts

2. Aseptic insertion

2. PROM - Pain

What do we want?

1. Inserted on the first attempt ✓
 2. Keeps working and no infection ✓
 3. Comfortable for the patient ✓
 4. Patient engaged in care ✓
 5. Removed when therapy complete ✓
- Documented in medical record ✓



To ensure representative measures:

- Choose one or more measures (Peripherally compatible meds; Aseptic Insertions; I-DECIDED; PREM; PROM; Device failure)

If you can't audit ALL patients

- Obtain complete list of all hospitalised patients on one day/date
- Decide how many patients you can audit
- Divide total number by number you can audit – this will give you an 'n'
- Take every 'nth' patient on the list and audit them

This means you don't introduce bias into the measures

Global VA Registry

Towards better health system data

- Current feasibility study
- Scoping of minimum dataset
 - Literature review
 - Interviews/focus groups
 - eDelphi survey
- Validate measures
- Consumer views, IT/privacy issues



OMG Study

J Hospital Medicine 2018
Alexandrou et al.



A screenshot of the OMG PIVC study website. At the top, there is a navigation bar with links for Home, About This Project, Hospital sites, The Research Team, FAQ, Newsletters, and Contact Us. Below the navigation bar, there is a banner for the study with the text "Participate in the One Million Global Catheters Study 2014-2015" and a row of flags representing the 51 participating countries. Below the banner, there is a section titled "Registration for the OMG PIVC study has now closed." with a globe icon and the text "Over 790 hospitals in more than 60 countries are enrolled to participate in this one-day prevalence study, making this the largest intravascular study ever undertaken! A huge thank you to everyone who has worked so hard and shown such amazing support for this ambitious project. If you have already registered to participate, don't forget that data collection finishes on 30 April 2015. If you have any questions, please contact us by email."

- 40620 patients
- 409 hospitals
- 51 countries
- 15 languages
- 4 million datapoints

Aim: to benchmark processes of care

OMG - Latin America

1. Argentina
2. Bolivia
3. Brazil
4. Chile
5. Colombia
6. Mexico
7. Panama
8. Peru
9. El Salvador
10. Venezuela



Laura Alberto, PhD Candidate
Chief Investigator & LATAM
Coordinator
onemillion@sagrado-
corazon.com.ar
laura.alberto@griffithuni.edu.au



Gracias! Thank you!



Findings of OMG Study



Idle **14%**



Suboptimal dressing **21%**

Phlebitis **10%**



No documented site assessment **36%**



PIVC malfunction **10%**



No documented insertion date/time **49%**



Area of flexion **75%**

WORLDWIDE PRIORITIES
No documentation last 24h
~~Idle PIVs~~
Symptomatic PIVs
Substandard dressings

LATIN AMERICA

Reduce 18 gauge use
Reduce use of non-sterile tape
as PIV dressing
Use dressing PLUS securement
Reduce blood in line

CENTRE HOSPITALIER MÉMORI
FRANCE ÉTATS-UNIS DE SAINT-LO



Care “Bundles”

- ✓ Bundle items must be based on level 1 evidence
- ✓ Are ALL necessary
- ✓ Can be answered “yes”/“no” if done/not done
- ✓ Must occur every day
- ✓ Should suit almost all patients with the condition



Bundles don't work by themselves.

Sustainability is not guaranteed.

Bundles can work if:

- Multi-modal approach
- Cultural and system changes also made

Bundle - definition

“A structured way of improving the processes of care and patient outcomes:

a small, straightforward **set of evidence-based practices — generally three to five —**

that, when performed collectively and reliably, have been proven to improve patient outcomes”.

www.ihl.org



**What PIVC interventions are proven in RCTs or meta-analyses?
Takashima et al 2015 Vascular Access**

Bundle items with RCT evidence

Gonzalez Lopez et al J Hosp Infect 2014

- Integrated PIVC with flatter profile against skin

Signif 1 day longer function



Bugden et al Annals Emerg Med 2016

- Tissue adhesive
- 1-2 drops

Signif 10% reduced PIV failure



Bundle items with systematic review evidence

Offer vapocoolant spray

Griffith et al 2016 Cochrane Systematic Review
9 RCTs, 1070 paed-adults
Signif reduction in pain (33 to 20 out of 100)
72% said they would want it again



Do not routinely remove PIVCs

Webster et al. 2015 Cochrane SR
7 RCTs, 4895 patients
No diff in complications or infections
Signif cost savings and less procedures



Evidence from cohort studies

Significant predictors of failure

1. Insertion at flexion point
2. Traumatic insertion
3. Gauge size/length
4. Poor securement
5. Multiple use

Marsh et al. J Hospital Medicine, 2018; 13:83-89; Wallis et al Infect Cont Hosp Epi 2014

Infection prevention bundle items (strong epidemiological evidence)

ANTT & hand hygiene on insertion - *and during use*

Skin decontamination with CHG in alcohol

Sterile dressing

Consider removal daily

Decontaminate access points before each use



Reducing risk must cover the entire dwell

**PIVC
Insertion
bundle**



**+ PIVC
Maintenance
bundle**

We need both

Insertion bundle

1. Use ANTT & hand hygiene
2. Offer vapocoolant spray
3. Decontaminate skin with alcoholic CHG & let dry
4. Use an integrated PIVC
5. One-two drops of glue to entry point & under hub with a sterile dressing



Maintenance bundle

I-DECIDED™ INSTRUMENTO DE EVALUACIÓN & DECISIÓN IV

I	IDENTIFICAR Si el paciente tiene un catéter IV.
D	¿EL DISPOSITIVO IV ES NECESARIO? Considere la retirada si no se utilizó en las últimas 24 horas, o es improbable su uso en las siguientes 24 horas. Considere el cambio a medicamentos orales.
E	¿EFECTIVO funcionamiento? Siga las recomendaciones de la institución sobre la verificación y el mantenimiento de la permeabilidad.
C	¿COMPLICACIONES en el sitio de inserción IV? Dolor $\geq 2/10$, enrojecimiento, edema, fuga, infiltración, extravasación, endurecimiento, cordón venoso palpable o purulencia
I	INFECCIÓN prevención Higiene de manos. Realizar antisepsia de las conexiones & permitir secar. Uso cuidadoso de los dispositivos de administración.
D	DETERMINAR CURACIÓN & sujeción. Curación limpia, seca e intacta. Catéter IV y tubuladuras aseguradas.
E	EDUCAR & EVALUAR. Discutir el plan de cuidado IV con el paciente y la familia
D	DOCUMENTAR su decisión. Mantener, cambiar la curación, o quitar el catéter IV. Siempre considere la política de su institución y consulte a el equipo y el paciente, según necesidad.

VASCULAR

Vascular Access Catheter Use in Latin America



- Argentina
- Brazil
- Chile
- Colombia
- Mexico

2018-2019

Academic study with funding from BD

Lead investigator

- Dr Rachel Walker, Melissa Arneil, and Claire Rickard, Griffith University, Australia

Latin America Lead Investigator

- Prof Mavilde Pedreira, Unifesp, Brazil

Lead study contacts

- Cirlia Alvarez, Argentina
- RAs: Maria Paula Pires, Larissa Perez, Marcelle Ambar, Silvia Azevedo - Prof Maria Angélica Peterlini and Prof Denise Kusahara, Brazil
- Marcela Quintanilla Reyes, Chile
- Martha Claudia Corzo, Colombia
- Gabriela Cortes Villareal and Eliazib Nataren, Mexico



Rachel

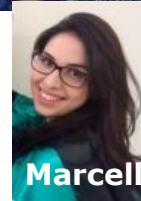
Claire



Mavilde



Mel



Marcell



Mª Paula



Mª Angélica

Cirlia



Martha



Marcela

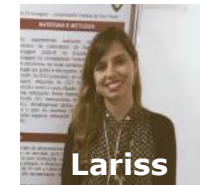


Gabriela



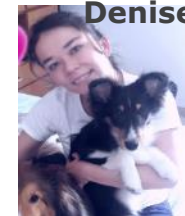
Eli

Silvia



Lariss

Denise



Objectives

1. What is happening with PIVCs in my hospital?
2. How does my care compare to best practice guidelines?
3. Are PIVCs causing bloodstream infection risk?
4. Are patients having a good experience ?
5. What is the economic burden of PIVCs?
6. How can we improve?

Aim: a
more
indepth
LATAM
study
than the
OMG
study

Each hospital will receive an individual report

VASCULAR
Vascular Access Care in Latin America

USO DE CATÉTERES INTRAVENOSOS PERIFÉRICOS (CIP) EM HOSPITAIS DA AMÉRICA LATINA (AL)

VASCULAR é um estudo multinacional e transversal, coordenado pelo mesmo grupo de pesquisa do estudo CMG - "One Million Global Peripheral Intravenous Catheter Study".

OBJETIVOS

- Conhecer a prevalência de uso de CIP em hospitais da AL.
- Verificar a prevalência de CIP redundantes (instalação, mas não utilizados), e de complicações com os CIP.
- Identificar a prevalência de fatores de risco para infecção no ponto de CIP.
- Comparar as práticas de cuidado de CIP observadas com as recomendações internacionais.

RELEVÂNCIA

Cerca de **1 BILHÃO** de CIP são utilizados no mundo. CIP trazem inúmeros benefícios, contudo, complicações podem ocorrer, como:

- Flebite
- Infecção
- Falha na junção

Esses eventos adversos aumentam o desconforto do paciente, prolongam o tratamento, aumentam os custos e aumentam o tempo de internação.

Referência: <http://www.organo.org/doi/>

IMPORTÂNCIA DO ESTUDO NA AL

Informações sobre a prática clínica do uso de CIP nos hospitais da AL são escassas. Embora pesquisas sobre dispositivos de acesso vascular estejam crescendo exponencialmente, grande parte dos dados são provenientes de países desenvolvidos, que possuem maior orçamento disponível para a saúde.

PORTANTO Não são comparáveis com os países da AL.

VANTAGENS

As evidências obtidas com esse pesquisa poderão ser utilizadas: No desenvolvimento de práticas clínicas, de educação e de políticas de saúde.

Conscientizando e melhorando o cuidado e manejo do CIP.

Essas informações também podem potencialmente gerar mudanças de comportamento desfavoráveis de CIP e reduzir substancialmente os custos com assistência à saúde.

COMO PARTICIPAR?

Qualquer hospital pode participar! (gerar, avaliar, ou reaproveitar)

Entre em contato conosco! vascularstudybrazil@gmail.com

REDES SOCIAIS

Esperamos que você se junte a nós e dissemine esta informação nas suas redes!

Twitter: [@VascularStudy](https://twitter.com/VascularStudy)

Facebook: <https://www.facebook.com/VascularStudy/>

Website: <https://www.avatargroup.org.au/vascular-study.html>

COORDENAÇÃO: Griffith University, AVATAR, COLABORAÇÃO: Sociedade Brasileira de Acesso Vascular

Invitation to participate



Marcela Quintanilla Reyes
mquintanillareyes@yahoo.com

Facebook/Twitter:
@VascularStudy

VASCULAR
Vascular Access Care in Latin America

USO DE CATÉTERES VENOSOS PERIFÉRICOS CORTOS EN AMÉRICA LATINA

VASCULAR es un estudio multinacional y transversal coordinado por AVATAR, el mismo grupo de investigación responsable del estudio CMG - "Un millón de estudios de catéter intravenoso periférico global".

OBJETIVOS

- Identificar la prevalencia de CVPC.
- Identificar la prevalencia de CVPC redundante (sin uso intencional) y complicaciones.
- Identificar la prevalencia de los factores de riesgo de infección o falla CVPC.
- Comparar las prácticas actuales de cuidado CVPC con recomendaciones de guías.

PERTINENCIA

Acerca de **1 MIL MILLONES** de CIP se utilizan en todo el mundo. Los CVPC pueden ofrecer muchos beneficios, sin embargo, pueden ocurrir complicaciones, como:

- Flebitis
- Infección
- Falta de junción venosa

Estos eventos adversos aumentan la morbilidad del paciente, prolongan el tratamiento, aumentan los costos y prolongan la duración de la estancia en el hospital.

Referencia: <http://www.organo.org/doi/>

IMPORTANCIA DEL ESTUDIO

La información sobre la práctica clínica para los CVPC en hospitales latinoamericanos es escasa. Aunque las investigaciones sobre los dispositivos de acceso vascular están creciendo exponencialmente, gran parte de los datos provienen de países desarrollados, que tienen un mayor presupuesto disponible para la salud.

POR LO TANTO No son comparables con países de América Latina.

VENTAJAS

La evidencia obtenida de este estudio puede ser utilizada: En la creación de la práctica clínica, educación y políticas de salud.

Por consiguiente: Mejorando el cuidado y la administración de CVPC.

Esta valiosa información puede evitar millones de relaciones clínico-invasivas y reducir substancialmente los costos de atención médica.

¿COMO PARTICIPAR?

¡Cualquier hospital puede unirse! (generar, evaluar o reutilizar)

¡Contáctanos! estudiovascularargentina@gmail.com

MEDIOS DE COMUNICACIÓN SOCIAL

¡Esperamos que se una a nosotros y difunda esta información en sus redes sociales!

Twitter: [@VascularStudy](https://twitter.com/VascularStudy)

Facebook: <https://www.facebook.com/VascularStudy/>

Website: <https://www.avatargroup.org.au/vascular-study.html>

COORDINACIÓN: Griffith University, AVATAR, SOCIEDAD: Sociedade Brasileira de Acesso Vascular







Australian Vascular Access Society
Promoting safety and excellence in Vascular Access

