



Sociedad Médica de Santiago
Sociedad Chilena de Medicina Interna
150 años al Servicio de la Medicina

IX CURSO MEDICINA INTERNA HOSPITALARIA 2019

PROCEDIMIENTOS GUIADOS POR ECOGRAFÍA

Dr. Fernando Román Ortega
Medicina Interna Hospitalaria
Hospital Clínico UC

Mapa de Ruta

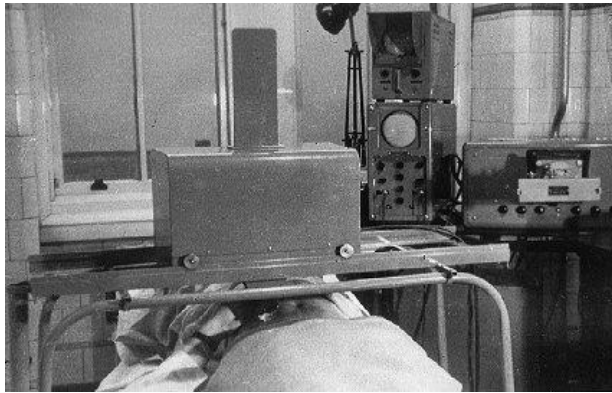
- Introducción
- Ultrasonido Clínico
- Procedimientos Guiados por Ecografía
 - Instalación Catéter Venoso Central
 - Otros
- Simulación
- Conclusión





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Introducción

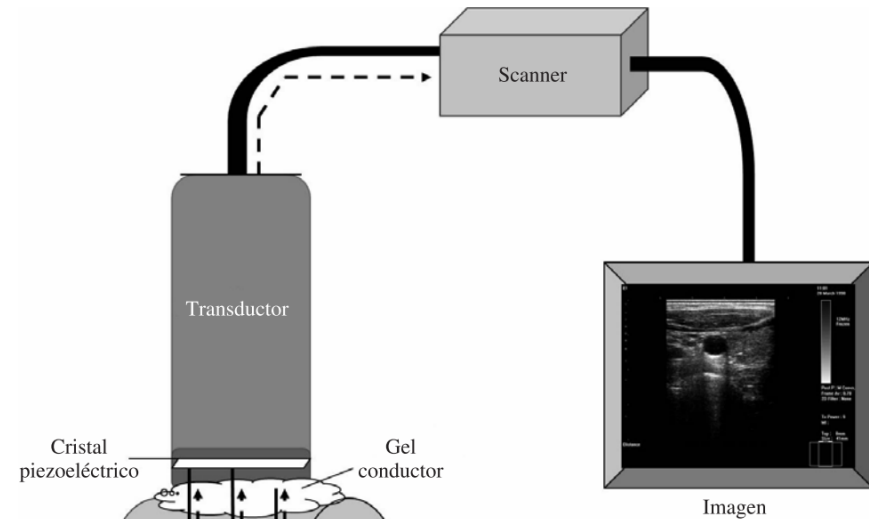
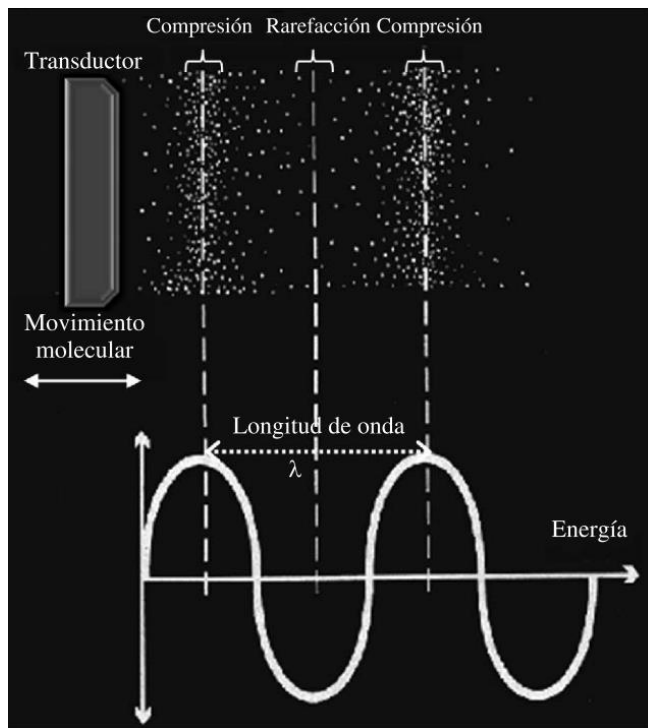




Ultrasonido Clínico

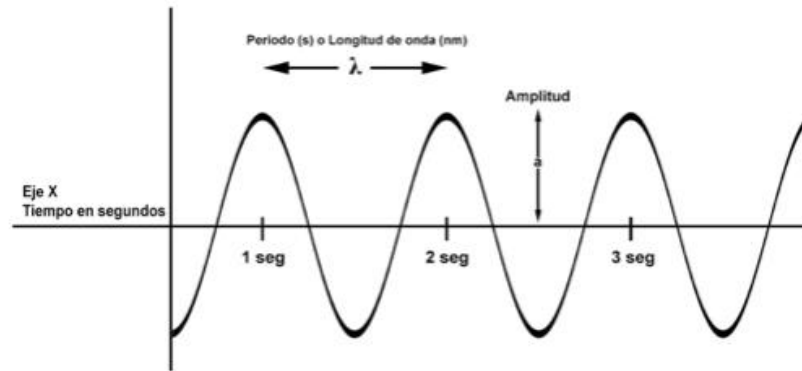
- Ventajas:
 - No utiliza radiación ionizante
 - Rápido de realizar
 - Bedside
 - Económico
- Desventajas:
 - Operador dependiente
 - No reemplaza estudio formal

¿Cómo funciona el Ultrasonido?





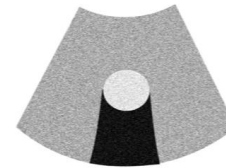
Nociones Básicas de Ultrasonido



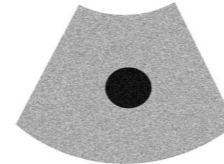
- Frecuencia
- Amplitud
- Intensidad
- Rapidez
- Resolución
- Profundidad
- Potencia / Ganancia
- Contacto

Tonalidades del Ultrasonido

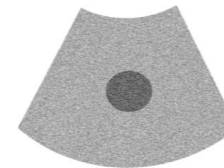
- Hiperecoica



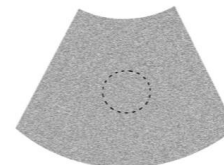
- Aneicoica



- Hipoecoica

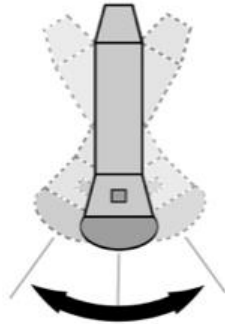


- Isoecoica

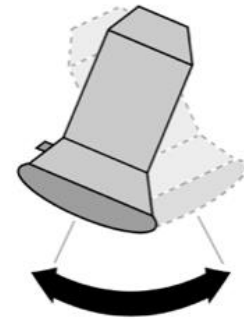


Movimientos del Transductor

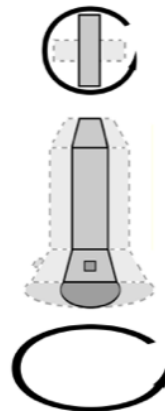
Abanicar



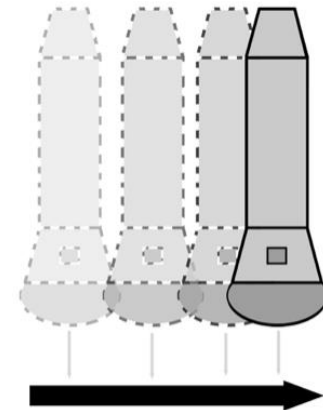
Mecer



Rotar



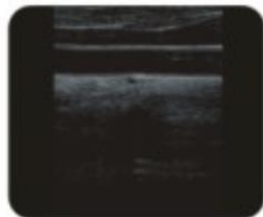
Trasladar



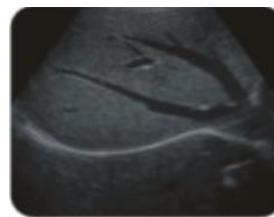
Tipos de Transductores de US



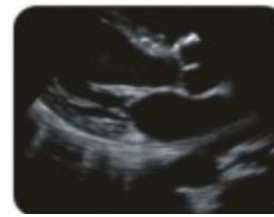
A Linear array probe



B Curved array probe



C Phased array probe



Procedimientos Guiados por Ecografía

- Accesos Vasculares
- Drenajes Pleurales
- Drenajes Peritoneales
- Biopsias
- Drenaje Colecciones
- Nefrostomías
- Anestesia Troncular
- Neurolisis química
- Tratamiento musculoesqueléticos



TEMPRANAS

- Arritmias
- Daño vascular
- Neumotórax
- Hemotórax
- Taponamiento cardíaco
- Lesión neurológica
- Embolización (incluyendo alambre guía, catéter, o aire)

TARDÍAS

- Infección
- Trombosis
- Embolización
- Erosión/perforación de vasos sanguíneos
- Taponamiento cardíaco
- Daño linfático
- Fístula arteriovenosa

Accesos Venosos Centrales

Técnica Guiada por Sitios Anatómicos

Table 1. Rates of mechanical complications for central venous catheterization

Access Complications	Internal Jugular Vein, %		Subclavian Vein, %		Femoral Vein, %		Overall Range, %
	Adult	Pediatric	Adult	Pediatric	Adult	Pediatric	
Arterial puncture	5	0–26.7	3.2–4.9	5.1–6.6	7.1–15	6.3–12.8	0–26.7
Pneumothorax	0	0	1.5–2.8	1.3–2.5	NA	NA	0–2.8
Hemothorax	0	0	0.5	1.2	NA	NA	0–1.2
Failed puncture	25	20–39.1 ^a	12	9.9	15–37	No data	9.9–39.1
Catheter malposition	No data	20	No data	2.2–16.1	No data	4.7	0–20
Other severe	No data	No data	No data	No data	1.4	No data	0–1.4
Other minor	No data	No data	6.9	No data	1.4–4.4	No data	1.4–6.9
Overall range	0–32.5	0–39.1	0.5–12	1.2–16.1	1.4–37	4.7–12.8	0–39.1

NA, not applicable.

^aAccounts for children <1 yr of age and/or <10 kg of body weight. Data collection from references 18–21, 24, 25, 27, 32–35.

Ultrasound guidance versus anatomical landmarks for internal jugular vein catheterization (Review)



Cochrane
Library



Cochrane Database of Systematic Reviews

Brass P, Hellmich M, Kolodziej L, Schick G, Smith AF

Outcomes	Illustrative comparative risks* (95% CI)		Relative effect (95% CI)	Number of participants (studies)	Quality of the evidence (GRADE)
	Assumed risk	Corresponding risk			
	Anatomical landmark	Ultrasound guidance			
Complication rate total	Study population		RR 0.29 (0.17 to 0.52)	2406 (14 studies)	⊕○○○ Very low ^{a,b,c,d}
	135 per 1000	39 per 1000 (23 to 70)			
	Moderate				
	136 per 1000	39 per 1000 (23 to 71)			
Overall success rate	Study population		RR 1.12 (1.08 to 1.17)	4340 (23 studies)	⊕○○○ Very low ^{c,e,f,g}
	876 per 1000	982 per 1000 (946 to 1000)			
	Moderate				
	850 per 1000	952 per 1000 (918 to 994)			

Ultrasound guidance versus anatomical landmarks for internal jugular vein catheterization (Review)



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Brass P, Hellmich M, Kolodziej L, Schick G, Smith AF

Number of attempts until success		Mean number of attempts until success in the intervention groups was 1.19 lower (1.45 to 0.92 lower)		3302 (16 studies)	⊕○○○ Very low ^{c,g,h,i}
Arterial puncture	Study population		RR 0.28 (0.18 to 0.44)	4388 (22 studies)	⊕⊕○○ Low ^{c,j,k,l}
	94 per 1000	26 per 1000 (17 to 41)			
	Moderate				
	84 per 1000	24 per 1000 (15 to 37)			
Other complications (thrombosis, embolism, haematomediastinum and hydro-mediastinum, haematothorax and hydrothorax, pneumothorax, subcutaneous emphysema, nerve injury)	Study population		RR 0.34 (0.15 to 0.76)	3042 (11 studies)	⊕⊕⊕○ Moderate ^{c,m,n,o}
	30 per 1000	10 per 1000 (4 to 23)			
	Moderate				
	23 per 1000	8 per 1000 (3 to 17)			
Time to successful cannulation		Mean time to successful cannulation in the intervention groups was 30.52 lower (55.21 to 5.82 lower)		3451 (20 studies)	⊕○○○ Very low ^{d,p,q,r}
Success with attempt number 1	Study population		RR 1.57 (1.36 to 1.82)	2681 (18 studies)	⊕⊕⊕○ Moderate ^{c,s,t}
	501 per 1000	787 per 1000 (682 to 912)			

Ultrasound guidance versus anatomical landmarks for subclavian or femoral vein catheterization (Review)



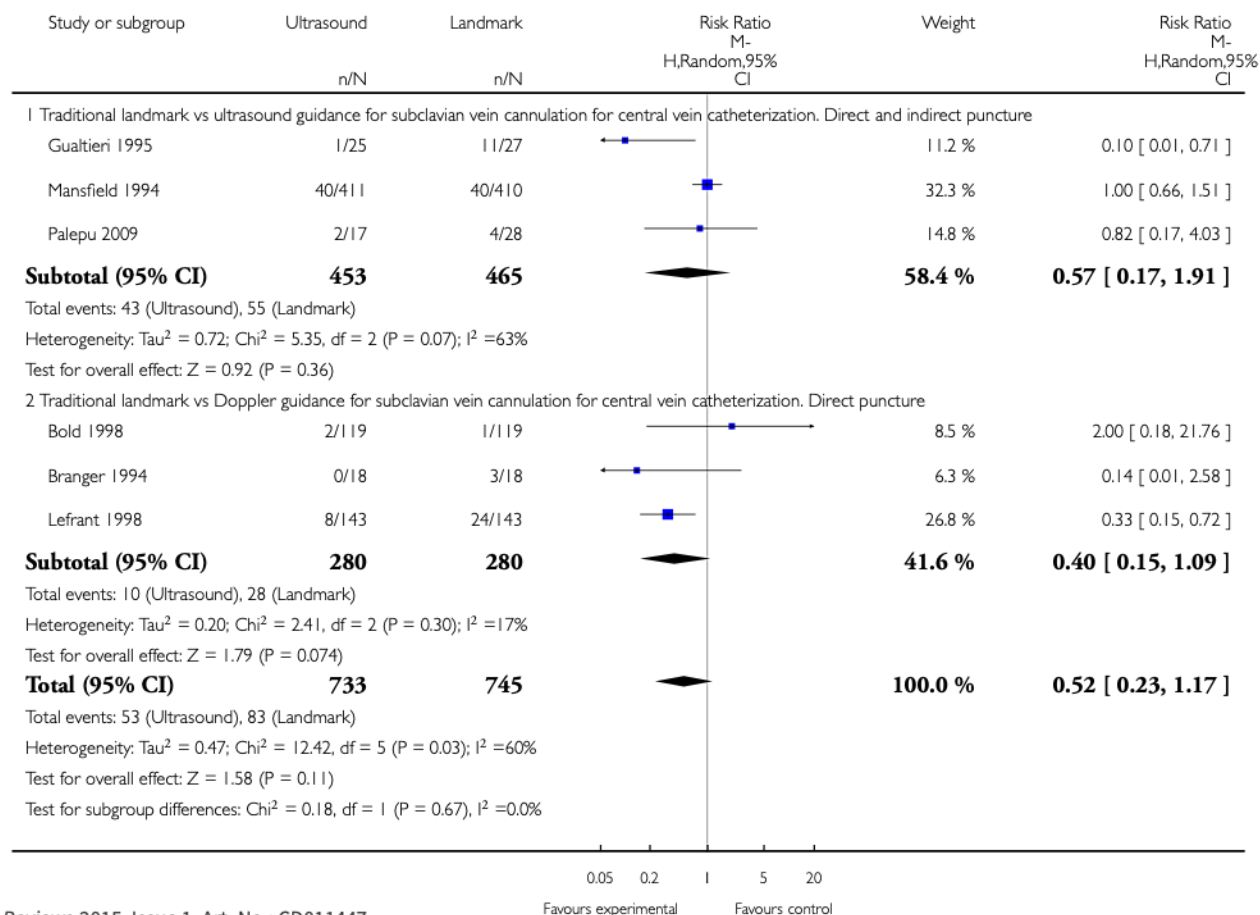
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Cochrane Database of Systematic Reviews



Brass P, Hellmich M, Kolodziej L, Schick G, Smith AF

Outcome: 1 Complication rate total



Ultrasound guidance versus anatomical landmarks for subclavian or femoral vein catheterization (Review)



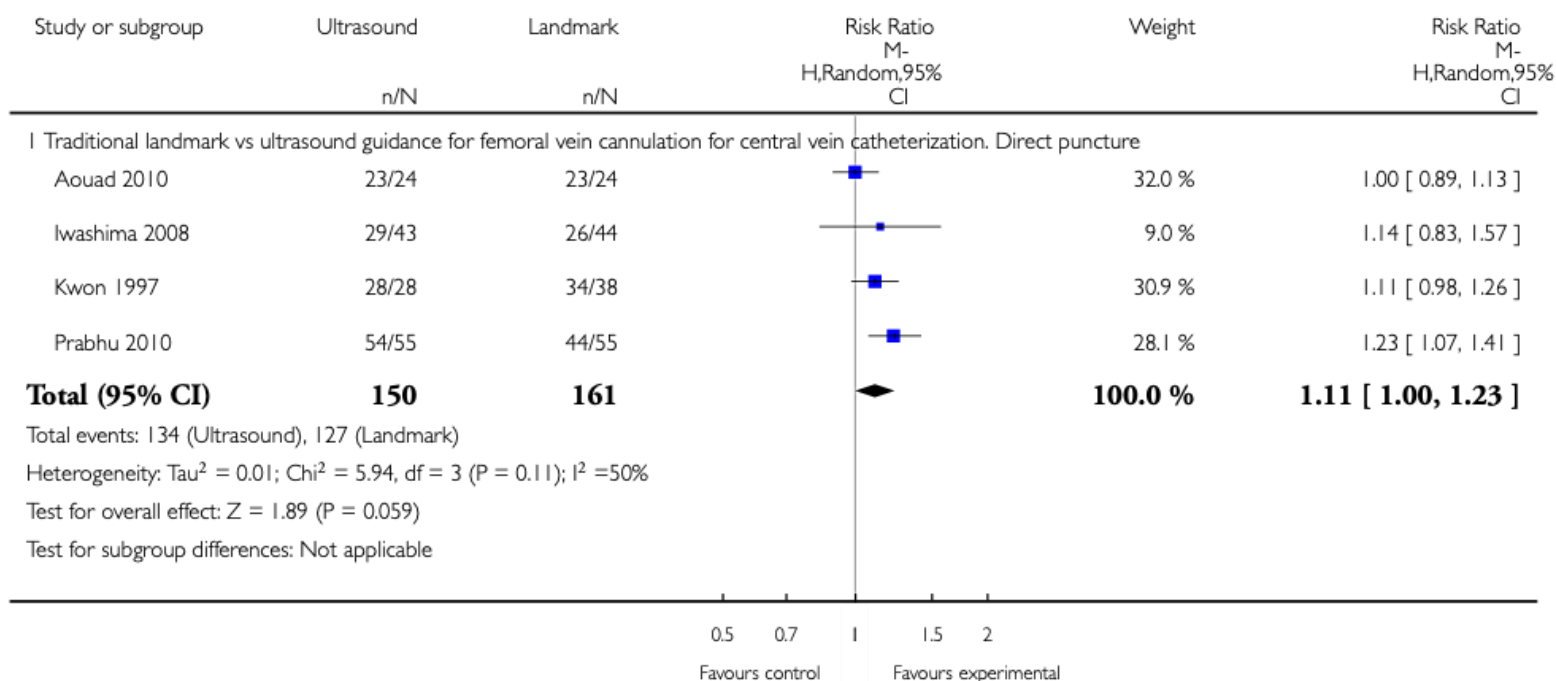
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Cochrane Database of Systematic Reviews



Brass P, Hellmich M, Kolodziej L, Schick G, Smith AF

Outcome: I Overall success rate



Ultrasound use for the placement of haemodialysis catheters (Review)



Cochrane
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Cochrane Database of Systematic Reviews



Rabindranath KS, Kumar E, Shail R, Vaux EC

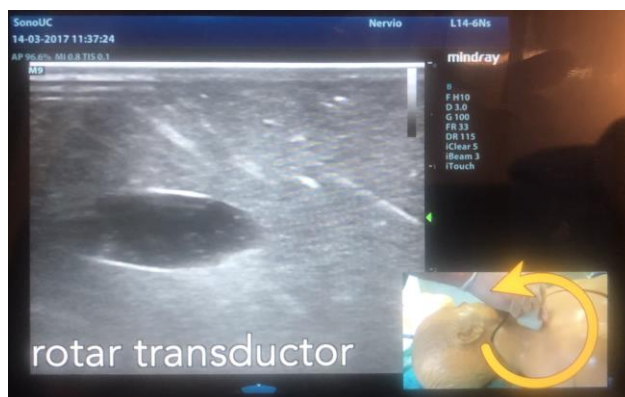
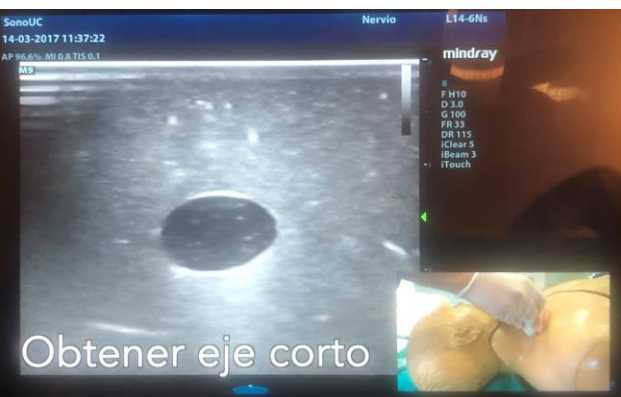
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Failed catheter placement (overall)	7	830	Risk Ratio (M-H, Random, 95% CI)	0.11 [0.03, 0.35]
2 Failed catheter placement (first attempt)	5	705	Risk Ratio (M-H, Random, 95% CI)	0.40 [0.30, 0.52]
3 Attempts/catheter insertion	1		Mean Difference (IV, Random, 95% CI)	Totals not selected
4 Time for cannulation (anaesthesia to vein puncture)	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
5 Arterial puncture	6	785	Risk Ratio (M-H, Random, 95% CI)	0.22 [0.06, 0.81]
6 Haematoma	4	323	Risk Ratio (M-H, Random, 95% CI)	0.27 [0.08, 0.88]
7 Pneumothorax or haemothorax	5	675	Risk Ratio (M-H, Random, 95% CI)	0.23 [0.04, 1.38]



Instalación CVC bajo Técnica Guiada por Ultrasonido

1. Evaluar Indicación / Excluir Contraindicaciones
2. Explicar Complicaciones
3. Preparación del equipo y del paciente
4. Técnica de Punción
 - Evaluar Eje Corto / Eje Largo
 - Selección sitio punción
 - Pasar la guía
 - Confirmación de posición
 - Dilatación
 - Paso de Catéter
 - Fijación a la piel

Técnica Guiada por Ultrasonido





Otros procedimientos guiados por Ultrasonido

- Accesos Vasculares
 - Accesos Periféricos / PICC
- Ultrasonografía Pulmonar
 - Guía Toracocentesis
 - Diagnóstico Neumonía / Neumotórax
- Ultrasonografía Abdominal
 - Guía Paracentesis
 - Retención Urinaria
 - Ubicación sonda: CUP / SNE
- Respuesta a Volumen

Ultrasonografía en la Práctica Clínica

- Disponibilidad de Equipos de Ultrasonido



- Entrenamiento Profesional



Simulación en CVC

- Seguridad y calidad asistencial
- Práctica deliberada
- Enseñanza casos complejos
- Aprender de errores
- Trabajo interdisciplinario
- Comunicación
- Evaluaciones
- Investigación

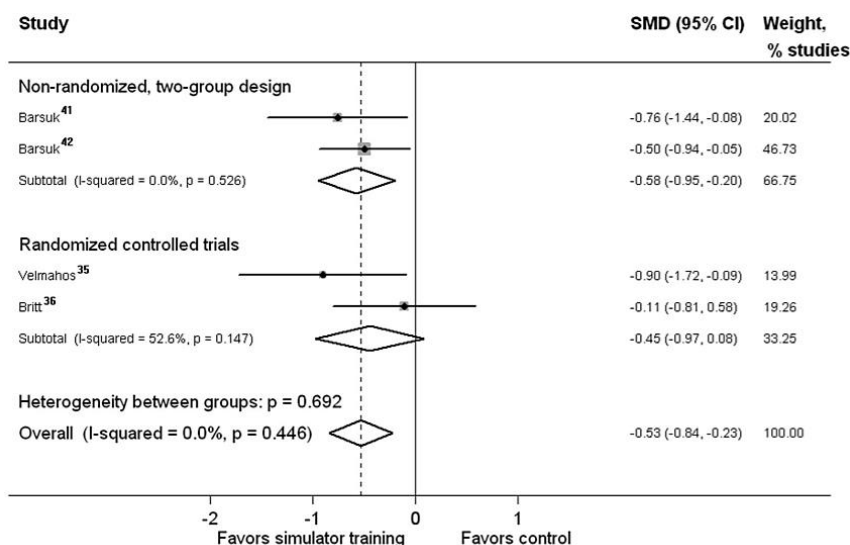


Use of Simulation-Based Education to Improve Outcomes of Central Venous Catheterization: A Systematic Review and Meta-Analysis

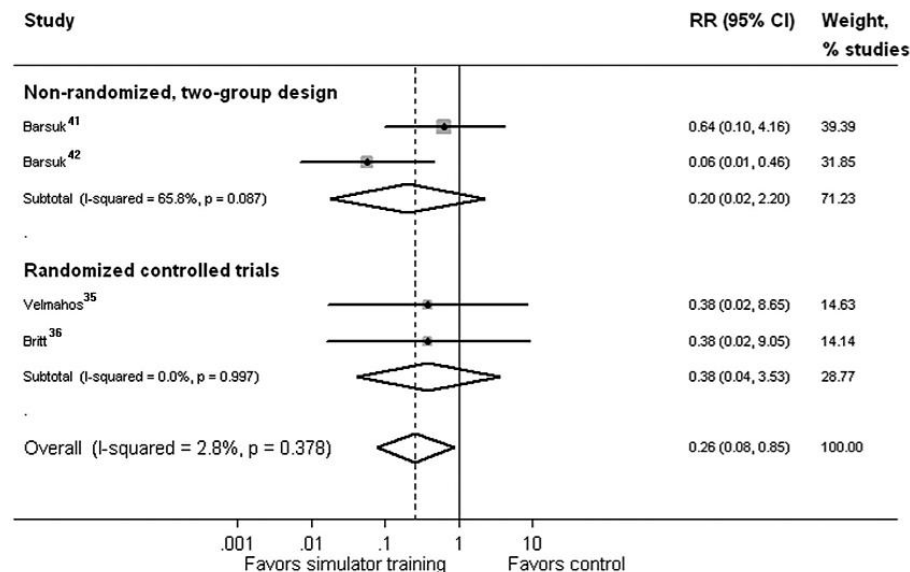
Irene W. Y. Ma, MD, MSc, FRCPC, Mary E. Brindle, MD, FRCPC, Paul E. Ronksley, MSc, Diane L. Lorenzetti, MLS, Reg S. Sauve, MD, MPH, FRCPC, and William A. Ghali, MD, MPH, FRCPC



Acad Med. 2011;86:1137-1147.
First published online July 21, 2011
doi: 10.1097/ACM.0b013e318226a204



Numero de Punciones



Punciones Arteriales



POCUS en Medicina Interna

PERSPECTIVE



Internal Medicine Point-of-Care Ultrasound Curriculum: Consensus Recommendations from the Canadian Internal Medicine Ultrasound (CIMUS) Group

*Irene W. Y. Ma, MD, PhD, FRCPC, FACP, RDMS^{1,2}, Shane Arishenkoff, MD, FRCPC³,
Jeffrey Wiseman, MD, MAEd, FRCPC⁴, Janeve Desy, MD, FRCPC¹,
Jonathan Ailon, MD, FRCPC, MSc⁵, Leslie Martin, MD, FRCPC⁶, Mirek Otremba, MD, FRCPC⁵,
Samantha Halman, MD, FRCPC, MMED⁷, Patrick Willemot, MD, CM⁴, and Marcus Blouw, MD, MHA,
FRCPC⁸ On behalf of The Canadian Internal Medicine Ultrasound (CIMUS) Group *Khalid Azzam,
Marko Balan, Sharon E. Card, Tara Cessford, Barry Chan, Darrel Cotton, Colin R. Gebhardt,
Neil E. Gibson, Catherine J. Gray, Rajender Hanmiah, Babar A. Haroon, Dev Jayaraman,
Alexandre Lafleur, Ada Lam, Jed Lipes, Michael Mayette, Steven J. Montague, Hassan Mustafa,
Leanne Reimche, Jennifer Ringrose, Stephanie Rodrigue, Mireille Sayegh, Jeffrey P. Schaefer,
Steven Shadowitz and Stephanie Tom*

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POCUS en Medicina Interna

Core PGY 1–3 Curriculum

Volume status	
Inferior vena cava*	35 (95)
Lung	
B lines	36 (95)
Pleural effusion	38 (100)
Abdomen	
Free fluid/ascites	38 (100)
Procedure guidance	
Central venous catheterization	37 (97)
Thoracentesis	38 (100)
Paracentesis	38 (100)

Expanded PGY 4–5 Curriculum†

Volume status	
Internal jugular vein*	32 (86)
Lung	
Consolidation	36 (95)
Pneumothorax	36 (95)
Soft tissue/musculoskeletal	
Knee effusion	33 (87)
Cardiac	
Gross left ventricular systolic function	38 (100)
Pericardial effusion	38 (100)
Right ventricular strain	33 (87)
Procedure guidance	
Knee arthrocentesis	32 (84)
Arterial line insertion	35 (92)
Arterial blood gas sampling	33 (87)
Peripheral venous catheterization	31 (82)



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