

<和文論文>

シソーラスの探索

①	中心静脈カテーテルと超音波診断を検索し、該当する用語を抽出
②	得られたシソーラスで再検索し、関連のあるシソーラスを抽出
③	②を繰り返し、文献のタイトルと抄録からシソーラスを確認し、「中心静脈カテーテル法」「超音波診断」が文献に含まれていることを確認

検索式と絞り込みの過程

	検索式	件数	検索日
医中誌WEB	(中心静脈カテーテル法/TH) and (PT=会議録除く)	2,822	2018/1/22
	(超音波診断/TH) and (PT=会議録除く)	97,773	2018/1/22
	(中心静脈カテーテル法/TH and [超音波診断]/TH) and (PT=会議録除く)	318	2018/1/22
	(中心静脈カテーテル法/TH and [超音波診断]/TH) and (PT=症例報告除く) and (PT=会議録除く) and CK=ヒト	58	2018/1/22
絞り込み	タイトルと抄録	10	
	本文	5	

研究デザインとアウトカムのレベル

		アウトカムレベル				計
		1:臨床アウトカム	2:代替アウトカム	3:安全と間接的に関係するその他の測定可能なアウトカム	4:エラーや有害事象の減少に寄与するアウトカムがない	
研究デザインレベル	1A:システマティックレビューまたはメタアナリシス	0	0	0	0	0
	1:無作為化比較試験	0	0	0	0	0
	2:非無作為化比較試験	0	0	0	0	0
	3:対照群のある観察研究	2	3	0	0	5
	4:対照群のない観察研究	0	0	0	0	0
	計	2	3	0	0	5

介入の内容と研究デザインレベル

	論文数	1A:システムティックレビューまたはメタアナリシス	2:非無作為化比較試験	3:対照群のある観察研究
CV挿入(超音波ガイド法とランドマーク法の比較)	3	0	0	3
CV挿入(認定医制度導入前後の比較)	1	0	0	1
CV挿入(超音波導入前後の比較)	1	0	0	1
合計	5	0	0	5

介入の内容とアウトカムのレベル

	論文数	アウトカムのレベル			アウトカムの指標		
		1:臨床アウトカム	2:代替アウトカム	3:安全と間接的に関係するその他の測定可能なアウトカム	1:臨床アウトカム	2:代替アウトカム	3:安全と間接的に関係するその他の測定可能なアウトカム
CV挿入(超音波ガイド法とランドマーク法の比較)	3	1	2	0	合併症発生率	カテーテルの位置異常率、カテーテル留置の成功率	平均所要時間
CV挿入(認定医制度導入前後の比較)	1	0	1	0		インシデント発生率、穿刺回数	超音波ガイド下施行率、CV挿入に要した時間
CV挿入(超音波導入前後の比較)	1	1	0	0	合併症	穿刺回数	挿入所要時間
合計	5	2	3	0			

< 英文論文 >

MeSH termsの探索

①	"Catheterization"、"Catheters, indwelling"、"Ultrasonography"で検索し、得られた論文のMeSH termsを抽出
②	先行研究のAHRQ、コクランレビューで使用されている、論文のMeSH termsを抽出
③	①②で得られたMeSH termsで再検索し、関連のあるMeSH termsを抽出
④	③で得られたMeSH term13個について、ツリー構造を確認し、6個に絞り込んだ。

検索式と絞り込みの過程

	検索式	件数	検索日
PubMed	"catheterization"[MeSH Terms]	183,974	2018/3/1
	"catheters, indwelling"[MeSH Terms]	17,557	2018/3/1
	"ultrasonography"[MeSH Terms]	393,052	2018/3/1
	"jugular veins"[MeSH Terms]	10,753	2018/3/1
	"subclavian vein"[MeSH Terms]	4,326	2018/3/1
	"femoral vein"[MeSH Terms]	7,875	2018/3/1
	上記を全てORで連結	577,842	2018/3/1
	<Catheters> (((("catheterization"[MeSH Terms]) OR "catheters, indwelling"[MeSH Terms]) AND "jugular veins"[MeSH Terms]) OR "subclavian vein"[MeSH Terms]) OR "femoral vein"[MeSH Terms]	14,672	2018/3/1
	<Ultrasonography> "ultrasonography"[MeSH Terms]	393,052	2018/3/1
	上記の<Catheters>と<Ultrasonography>をANDで連結	2,179	2018/3/1
	絞り込み (((("catheterization"[MeSH Terms] OR "catheters, indwelling"[MeSH Terms]) AND "jugular veins"[MeSH Terms]) OR "subclavian vein"[MeSH Terms]) OR "femoral vein"[MeSH Terms]) AND "ultrasonography"[MeSH Terms] AND ("humans"[MeSH Terms] AND English[lang])	1,784	2018/3/1
	研究デザインを加えてさらに絞り込み (((("catheterization"[MeSH Terms] OR "catheters, indwelling"[MeSH Terms]) AND "jugular veins"[MeSH Terms]) OR "subclavian vein"[MeSH Terms]) OR "femoral vein"[MeSH Terms]) AND "ultrasonography"[MeSH Terms] AND ("humans"[MeSH Terms] AND English[lang]) AND ("Meta-Analysis as Topic"[Mesh] OR "Controlled Clinical Trials as Topic"[Mesh] OR "Case-Control Studies"[Mesh] OR "Cohort Studies"[Mesh] OR "Cross-Sectional Studies"[Mesh] OR "Observational Studies as Topic"[Mesh] OR Meta-Analysis[ptyp] OR systematic[sb] OR Controlled Clinical Trial[ptyp] OR Observational Study[ptyp] OR Comparative Study[ptyp])	814	2018/3/1
	※過去5年に絞って検索 (Cochrane Library のシステムティックレビュー論文が2013年までを対象として実施しており、それ以降の文献における知見について検討) (((("catheterization"[MeSH Terms] OR "catheters, indwelling"[MeSH Terms]) AND "jugular veins"[MeSH Terms]) OR "subclavian vein"[MeSH Terms]) OR "femoral vein"[MeSH Terms]) AND "ultrasonography"[MeSH Terms] AND ("humans"[MeSH Terms] AND English[lang]) AND ("Meta-Analysis as Topic"[Mesh] OR "Controlled Clinical Trials as Topic"[Mesh] OR "Case-Control Studies"[Mesh] OR "Cohort Studies"[Mesh] OR "Cross-Sectional Studies"[Mesh] OR "Observational Studies as Topic"[Mesh] OR Meta-Analysis[ptyp] OR systematic[sb] OR Controlled Clinical Trial[ptyp] OR Observational Study[ptyp] OR Comparative Study[ptyp]) AND ("2013/03/1"[PDat] : "2018/03/2"[PDat])	195	2018/3/1
	絞り込み	タイトルと抄録	33
	本文	20	2018/3/1

研究デザインとアウトカムのレベル

		アウトカムレベル				計
		1:臨床アウトカム	2:代替アウトカム	3:安全と間接的に関係するその他の測定可能なアウトカム	4:エラーや有害事象の減少に寄与するアウトカムがない	
研究デザインレベル	1A:システマティックレビューまたはメタアナリシス	2	2	0	0	4
	1:無作為化比較試験	0	7	0	0	7
	2:非無作為化比較試験	0	0	0	0	0
	3:対照群のある観察研究	3	6	0	0	8
	4:対照群のない観察研究	0	1	0	0	1
計		4	16	0	0	20

介入の内容と研究デザインレベル

	論文数	1A:システマティックレビューまたはメタアナリシス	1:無作為化比較試験	2:非無作為化比較試験	3:対照群のある観察研究
CVC(US vs LM)	19	4	7	0	8
合計	19	4	7	0	8

*US: Ultrasound, LM: Landmark

介入の内容とアウトカムのレベル

	論文数	アウトカムのレベル			アウトカムの指標		
		1:臨床アウトカム	2:代替アウトカム	3:安全と間接的に関係するその他の測定可能なアウトカム	1:臨床アウトカム	2:代替アウトカム	3:安全と間接的に関係するその他の測定可能なアウトカム
CVC(US vs LM)	19	4	15	0	Incidence of accidental arterial puncture, Complication rate, Inadvertent arterial puncture, Rate of total complication	Correct placement, Rate of real time US, Access time, Success rate, Number of attempt	None
合計	19	4	15	0			

超音波ガイド下中心静脈カテーテル挿入(Ultrasound guidance for central catheterization) 文献一覧

	執筆者、題名、雑誌・書籍名、出版日	研究デザインの種類	研究デザイン	介入の内容	対象者	アウトカムのレベル	アウトカムの指標	主な結果	活動・対策の短所	費用	その他
< 和文論文 >											
1	中心静脈カテーテル挿入に伴うインシデント発生防止を目指した中心静脈カテーテル挿入施行医認定制度の導入 舩形 尚(香川大学医学部附属病院 医療安全管理部), 豊嶋 克美, 寛 善行, 松本 佐和子, 岡野 圭一, 横見瀬 裕保, 千田 彰一 医療の質・安全学会誌(1881-3658)9巻2号 Page119-123(2014.04)	3: 対照群のある観察研究	前後比較研究	CVC挿入施行医認定制度の導入 医師免許取得後6年未満の医師は、1)医療安全管理部などが主催する実技研修の受講、2)CVC挿入介助の経験3回、3)診療科長の推薦を満たすものと定めた(研修医は取得後も指導医のもとで行うことが義務付けられた)。取得後6年以上の医師は、診療科長の推薦書提出のみでCVC挿入を許可されるものと定めた。同時に超音波ガイド下中心静脈穿刺を推奨、院内のME機器管理センターに携帯型中心静脈穿刺用超音波装置を設置し、病棟などでのCVC挿入に用いるように推奨した。	導入前6か月のCVC挿入224件、導入後1年間のCVC挿入件数391件	2: 代替アウトカム	インシデント発生率、CVC挿入部位、超音波ガイド下施行率、CVC挿入に要した時間・穿刺回数	本制度導入により、インシデント発生率(導入前4.9% vs. 導入後1.3%, p=0.026)、3bインシデント(発生率導入前2.2%、導入後0.3%、p=0.015)とともに低下した。 CVC挿入部位は、内頸静脈穿刺が増加し、鎖骨下静脈穿刺が減少した。超音波ガイド下施行率は、導入前7%、導入後64%に増加したが(p<0.001)、CVC挿入に要した穿刺時間や穿刺回数は変わらなかった。 本制度導入によって穿刺部位に変化が生じたことは、インシデント減少の一因と考えられた。 CVC挿入施行医認定制度の導入はCVC挿入に伴うインシデント減少に有用であった。	不明	なし	
2	リアルタイム超音波ガイド下鎖骨下・腋窩静脈穿刺法の安全性の検討 持田 崇(新潟県立中央病院 麻酔科), 清野 豊, 松田 敬一郎, 芳賀 美奈子, 山本 豪, 森平 貴, 渡辺 逸平 麻酔(0021-4892)63巻1号 Page57-61(2014.01)	3: 対照群のある観察研究	症例対照研究	鎖骨下・腋窩静脈への中心静脈カテーテルの留置(リアルタイム超音波ガイド下穿刺法(U群)、ランドマーク法(L群))	2008年1月から2012年3月まで局所麻酔下に鎖骨下・腋窩静脈に中心静脈カテーテル留置を行った355症例	1: 臨床アウトカム	合併症の発生率、カテーテル留置の成功率、カテーテル留置不成功の原因、平均手術時間	合併症発生率は、U群1.9%、L群8.7%とU群で有意に少なかった(P=0.005)。動脈穿刺の発生率は、U群1.9%、L群7.2%でU群で有意に低かった。オッズ比は0.200(95%CI 0.058-0.696)であった。RUSG穿刺法は、鎖骨下・腋窩静脈でも機械的合併症が抑えられる。 合併症の内訳は、U群では全て動脈穿刺であり、L群では動脈穿刺の他に気胸や神経損傷などより重篤な合併症が発生していた。 カテーテル留置成功率、手術時間は両群間で有意差はなかった。同方法は、手技の習熟を前提に安全に施行できる。	不明	なし	
3	小児患者におけるリアルタイム超音波ガイド下内頸静脈挿管の時間消費リスク 従来の2種の技法との比較 (Time-consumption risk of real-time ultrasound-guided internal jugular vein cannulation in pediatric patients: comparison with two conventional techniques)(英語) Yoshida Hitoshi(弘前大学 医学研究科 麻酔科学講座), Kushikata Tetsuya, Kitayama Masatou, Hashimoto Hiroshi, Kimura Futoshi, Niwa Hidetomo, Ishihara Hironori, Hirota Kazuyoshi Journal of Anesthesia(0913-8668)24巻4号 Page653-655(2010.08)	3: 対照群のある観察研究	症例対照研究	リアルタイム超音波ガイド(USG)、解剖学的指標(AL)、audio-Dopplerガイド(ADG)での挿入	小児の心血管手術を受ける患者の11年間にわたるCV挿入	2: 代替アウトカム	挿管の成功率と麻酔導入から挿管までの時間	リアルタイム超音波ガイド(USG:90%)による成功率は、解剖学的指標(AL:76%)あるいはaudio-Dopplerガイド(ADG:74%)より良好で、所要時間はUSG(35.0±13.6分)と、AL(26.7±11.2分)やADG(29.2±8.9分)より長かった。しかし、USGは低体重(5kg未満)の患者の処置時間内で、他の方法より高い成功率を収めた。USGは有意な時間遅延を伴うものの、IJV挿管の最も高い成功率をもたらす、低体重群では時間遅延もなく最も有用であった。	不明	なし	

	執筆者、題名、雑誌・書籍名、出版日	研究デザインのレベル	研究デザイン	介入の内容	対象者	アウトカムのレベル	アウトカムの指標	主な結果	活動・対策の短所	費用	その他
4	当科における中心静脈ライン挿入の臨床的検討 里見 貴史(東京医科大学 口腔外科学講座)、長谷川 温、渡辺 正人、三木 保、千葉 博茂 日本口腔科学会雑誌(0029-0297)58巻4号 Page147-150(2009.09)	3: 対照群のある観察研究	前後比較研究	CV挿入術はガイドワイヤを用いて行い、穿刺の際は、ポータブル血管穿刺用超音波装置を使用。	2004年10月1日から2008年5月31日までのCVライン挿入を行った6913例(2004年10月1日から2005年7月30日までを導入前、2005年8月1日から2008年5月31日までを導入後とした)	1: 臨床アウトカム	合併症、穿刺回数、挿入所要時間	合併症(大腿動脈穿刺)については、導入前は、病院全体で9.4%、口腔外科で38.9%であり、導入後は、病院全体で4.2%、口腔外科で4.8%であった。穿刺回数は、導入前平均2.05回、導入後1.73回であった。CV挿入の所要時間は、20分未満が導入前は83%、導入後は74%、21-30分が導入前11%、導入後19%であった。	不明	なし	
5	中心静脈カテーテル先端の正確な設置を確認するための携帯式超音波装置の使用(Use of hand-held ultrasonography to confirm the correct placement of a central venous catheter tip)(英語) Ohta Tomoyuki(聖マリアナ医科大学 附属病院 超音波センター)、Tsujiimoto Fumio, Nakajima Yasuo, Ohyama Akihiro, Sakamoto Maho, Kishino Akiko, Hamasuna Kazumitsu, Ohno Giichiro, Tsugu Atsushi Journal of Medical Ultrasonics(1346-4523)34巻1号 Page69-72(2007.03)	3: 対照群のある観察研究	症例対照研究	中心静脈カテーテル(大腿静脈)を通常の方法(通常群)と、超音波誘導法(超音波群)での挿入。	2003年12月から2005年5月までの大腿静脈へ中心静脈カテーテルの挿入を行った94例。	2: 代替アウトカム	カテーテルの位置異常率	超音波群では2名(6.9%)、通常群では19名(29.2%)が位置異常であった。超音波誘導と通常のカテーテル挿入の相対リスクの比は0.23であった。リアルタイム超音波モニタリングは、大腿静脈から挿入した中心静脈カテーテルの位置異常を避けるのに有用と思われた。	不明	なし	

	執筆者、題名、雑誌・書籍名、出版日	研究デザインの種類	研究デザイン	介入の内容	対象者	アウトカムのレベル	アウトカムの指標	主な結果	活動・対策の短所	費用	その他
< 英文論文 >											
1	Single-Operator Ultrasound-Guided Central Venous Catheter Insertion Verifies Proper Tip Placement. Galante O, Slutsky T, Fuchs L, Smoliakov A, Mizrakli Y, Novack V, Brotfein E, Klein M, Frenkel A, Koifman L, Almog Y. Crit Care Med. 2017 Oct;45(10):e994-e1000. doi: 10.1097/CCM.0000000000002500.	3: 対照群のある観察研究	Prospective observational study with historical controls.	Ultrasound-assisted right-sided central venous catheterization or unassisted central catheter insertion	Adult ICUs. 64 consecutive patients undergoing ultrasound-assisted right-sided central venous catheterization compared with 92 serial historic controls who had unassisted central catheter insertion at the same sites.	2: 代替アウトカム	Correct placement of the catheter tip determined by postprocedural chest radiography.	The tip was accurately positioned in 59 of 68 patients (86.7%) in the ultrasound-assisted group compared with 51 of 94 (54.8%) in the control group (p < 0.001). The median time from end of the procedure to catheter utilization after chest radiography approval was 2.4 hours. A single-operator ultrasound-guided central venous catheter insertion is effective in verifying proper tip placement and shortens time to catheter utilization.	Unknown	None	
2	Accidental arterial puncture during right internal jugular vein cannulation in cardiac surgical patients. Maddali MM, Arun V, Wala AA, Al-Bahrani MJ, Jayatilaka CM, Nishant AR. Ann Card Anaesth. 2016 Oct-Dec;19(4):594-598. doi: 10.4103/0971-9784.191568.	3: 対照群のある観察研究	Prospective observational study	USG was used for the right internal jugular vein cannulation or USG was not used	255 consecutive adult and pediatric cardiac surgical patients were included. In Group I (n = 124) USG was used for the right internal jugular vein cannulation and in Group II (n = 81) it was not used. There were 135 adult patients and 70 pediatric patients.	1: 臨床アウトカム	Incidence of accidental arterial puncture during right internal jugular vein (RIJV) cannulation with and without ultrasound guidance (USG) if USG improves the chances of successful first pass cannulation and if BMI has an impact on incidence of arterial puncture and the number of attempts that are to be made for successful	The overall incidence of accidental arterial puncture in the entire study population was significantly higher when ultrasound guidance was not used (P < 0.001). In subgroup analysis, incidence of arterial puncture was significant in both adult (P = 0.03) and pediatric patients (P < 0.001) without USG. First attempt cannulation was more often possible in pediatric patients under USG (P = 0.03). In adult patients USG did not improve first attempt cannulation except in underweight patients. USG helped in the avoidance of inadvertent arterial puncture during RIJV cannulation and simultaneously improved the chances of first attempt cannulation in pediatric and in underweight adult cardiac surgical patients.	Unknown	None	
3	Real-time ultrasonography for placement of central venous catheters in children: A multi-institutional study. Gurien LA, Blakely ML, Russell RT, Streck CJ, Vogel AM, Renaud EJ, Savoie KB, Dassinger MS; Pediatric Surgery Research (PedSRC) Collaborative. Surgery. 2016 Dec;160(6):1605-1611. doi: 10.1016/j.surg.2016.05.019. Epub 2016 Jul 25.	3: 対照群のある観察研究	Retrospective cohort study	Landmark technique(LM) vs real-time ultrasonography(RTUS)	Using data gathered from 14 institutions, patients <18 years old who underwent central venous catheter placement. Patient demographics and operative details were collected. n=1134(total) , n=774(LM) and n=360(RTUS)	1: 臨床アウトカム	The rate of mechanical complications, The procedural success rates on first-site attempt,	Real-time ultrasonography was less likely to be used for subclavian vein (odds ratio = 0.002; P < .0001) and more likely to be used when coagulopathy (international normalized ratio >1.5) was present (odds ratio = 11.1; P = .03). The rate of mechanical complications was 3.5%. Real-time ultrasonography use was associated with greater procedural success rates on first-site attempt, but also with a greater risk of hemothorax. Pediatric surgeons access preferentially the subclavian vein for central venous access, yet are less likely to use real-time ultrasonography at this site. Real-time ultrasonography was superior to the landmark techniques for the first-site procedure success, yet was associated with greater rates of hemothorax.	Unknown	None	
4	Ultrasound-guided cannulation of the femoral vein in electrophysiological procedures: a systematic review and meta-analysis. Sobolev M, Shiloh AL, Di Biase L, Slovut DP. Europace. 2017 May 1;19(5):850-855. doi: 10.1093/europace/euw113. Review.	1A: システマティックレビューまたはメタアナリシス	Systematic review and meta-analysis	Ultrasound group vs palpation group	A comprehensive literature search of Medline, Embase, Google Scholar, and the Cochrane Central Register of Controlled Trials was performed. Five years of conference abstracts from the Heart Rhythm Society, European Heart Rhythm Association, and European Cardiac Arrhythmia Society were reviewed. Four trials, with a total of 4065 subjects, were included in the review, with 1848 subjects in the ultrasound group and 2217 subjects in the palpation group.	2: 代替アウトカム	Data were extracted on study design, study size, operator and patient characteristics, use of anticoagulation, vascular complication rates, first-pass success rate, and inadvertent arterial puncture.	Ultrasound guidance for femoral vein cannulation was associated with a 60% reduction of major vascular bleeding (relative risk, 0.40; 95% confidence interval, 0.28-0.91). Additionally, there was a 66% reduction in minor vascular complications (relative risk, 0.34; 95% confidence interval, 0.15-0.78). The use of real-time 2D ultrasound guidance for femoral vein cannulation decreases access-related bleeding rates and life-threatening vascular complications.	Unknown	None	

	執筆者、題名、雑誌・書籍名、出版日	研究デザインのレベル	研究デザイン	介入の内容	対象者	アウトカムのレベル	アウトカムの指標	主な結果	活動・対策の短所	費用	その他
5	Ultrasound guided internal jugular venous cannulation: comparison with land-mark technique. Riaz A, Shan Khan RA, Salim F. J Coll Physicians Surg Pak. 2015 May;25(5):315-9. doi: 05.2015/JCPSP.315319.	1: 無作為化比較試験	Randomized controlled trial	Real-time ultrasound-guided technique or land-mark technique.	A total of 200 patients who required internal jugular vein cannulation	2: 代替アウトカム	Access time, number of attempts until successful cannulation, complications and the demographics of each patient were recorded.	Access time was significantly less in real-time ultrasound group (34.95 ± 11.47 vs. 146.59 ± 40.20 seconds, p < 0.001). Cannulation was performed in first attempt in 99% of patients in ultrasound group as compared to 89% of landmark group. Complication rate was significantly higher in the land-mark group than in the ultrasound-guided group. Carotid artery puncture rate (9% vs. 1%) and haematoma formation (7% vs. 0%) were more frequent in the land-mark group than in the ultrasound-guided group. Brachial plexus irritation was also more in land-mark group (6% vs. 0%). Access time, failure rate and procedure related complications are reduced when real-time ultrasonography is used to cannulate internal Jugular vein.	Unknown	None	
6	Ultrasound-Guided Subclavian Vein Catheterization: A Systematic Review and Meta-Analysis. Lalu MM, Fayad A, Ahmed O, Bryson GL, Fergusson DA, Barron CC, Sullivan P, Thompson C; Canadian Perioperative Anesthesia Clinical Trials Group. Crit Care Med. 2015 Jul;43(7):1498-507. doi: 10.1097/CCM.0000000000000973. Review.	1A: システマティックレビューまたはメタアナリシス	Systematic Review and Meta-Analysis.	Ultrasound compared to landmark technique for subclavian catheterization	Medline, Embase, Cochrane Central Register of Controlled Trials, Cochrane Database of Systematic Reviews, and CINAHL (from inception to September 2014). Six hundred and one studies were reviewed and 10 met inclusion criteria (n = 2,168 participants). Six used dynamic 2D ultrasound (n = 719), one used static 2D ultrasound (n = 821), and three used Doppler-guided insertion techniques (n = 628).	2: 代替アウトカム	Outcomes of interest included safety and failure of catheterization	Overall complication rates were reduced with ultrasound use compared to the landmark group (odds ratio, 0.53; 95% CI, 0.41-0.69). Subgroup analysis demonstrated that dynamic 2D ultrasound reduced inadvertent arterial puncture, pneumothorax, and hematoma formation. No difference in failure of catheterization was noted between the ultrasound group and the landmark method (risk ratio, 0.85; 95% CI, 0.48-1.51). Subgroup analysis of dynamic 2D ultrasound demonstrated a significant decrease in failed catheterization (risk ratio, 0.24; 95% CI, 0.06-0.92). Ultrasound-guided subclavian catheterization reduced the frequency of adverse events compared with the landmark technique. Our findings support the use of dynamic 2D ultrasound for subclavian catheterization to reduce adverse events and failed catheterization.	Unknown	None	
7	Ultrasound guidance versus anatomical landmarks for subclavian or femoral vein catheterization. Brass P, Hellmich M, Kolodziej L, Schick G, Smith AF. Cochrane Database Syst Rev. 2015 Jan 9;1:CD011447. doi: 10.1002/14651858.CD011447. Review.	1A: システマティックレビューまたはメタアナリシス	Systematic Review	Ultrasound (US)- or Doppler ultrasound (USD)-guided puncture techniques for subclavian vein vs anatomical landmarks	We searched the Cochrane Central Register of Controlled Trials (CENTRAL) (2013, Issue 1), MEDLINE (1966 to 15 January 2013), EMBASE (1966 to 15 January 2013), the Cumulative Index to Nursing and Allied Health Literature (CINAHL) (1982 to 15 January 2013), reference lists of articles, 'grey literature' and dissertations. An additional handsearch focused on intensive care and anaesthesia journals and abstracts and proceedings of scientific meetings. We attempted to identify unpublished or ongoing studies by contacting companies and experts in the field, and we searched trial registers. We reran the search in August 2014. We will deal with any studies of interest when we update the review. Altogether 13 studies enrolling 2341 participants (and involving 2360 procedures)	1: 臨床アウトカム	Inadvertent arterial puncture, haematoma formation, complications, number of attempts until success or first-time success rates or time taken to insert the catheter	The quality of evidence was very low (subclavian vein N = 3) or low (subclavian vein N = 4, femoral vein N = 2) for most outcomes, moderate for one outcome (femoral vein) and high at best for two outcomes (subclavian vein N = 1, femoral vein N = 1). Most of the trials had unclear risk of bias across the six domains, and heterogeneity among the studies was significant. For the subclavian vein (nine studies, 2030 participants, 2049 procedures), two-dimensional ultrasound reduced the risk of inadvertent arterial puncture (three trials, 498 participants, risk ratio (RR) 0.21, 95% confidence interval (CI) 0.06 to 0.82; P value 0.02, I ² = 0%) and haematoma formation (three trials, 498 participants, RR 0.26, 95% CI 0.09 to 0.76; P value 0.01, I ² = 0%). No evidence was found of a difference in total or other complications (together, US, USD), overall (together, US, USD), number of attempts until success (US) or first-time (US) success rates or time taken to insert the catheter (US). For the femoral vein, fewer data were available for analysis (four studies, 311 participants, 311 procedures). No evidence was found of a difference in inadvertent arterial puncture or other complications. However, success on the first attempt was more likely with ultrasound (three trials, 224 participants, RR 1.73, 95% CI 1.34 to 2.22; P value < 0.0001, I ² = 31%), and a small increase in the overall success rate was noted (RR 1.11, 95% CI 1.00 to 1.23; P value 0.06, I ² = 50%). No data on mortality or participant-reported outcomes were provided. On the basis of available data, we conclude that two-dimensional ultrasound offers small gains in safety and quality when compared with an anatomical landmark technique for subclavian (arterial puncture, haematoma formation) or femoral vein (success on the first attempt) cannulation for central vein catheterization. Data on insertion by inexperienced or experienced users, or on patients at high risk for complications, are lacking. The results for Doppler ultrasound techniques versus anatomical landmark techniques are uncertain.	Unknown	None	

	執筆者、題名、雑誌・書籍名、出版日	研究デザインのレベル	研究デザイン	介入の内容	対象者	アウトカムのレベル	アウトカムの指標	主な結果	活動・対策の短所	費用	その他
8	Ultrasound guidance versus anatomical landmarks for internal jugular vein catheterization. Brass P, Hellmich M, Kolodziej L, Schick G, Smith AF. Cochrane Database Syst Rev. 2015 Jan 9;1:CD006962. doi: 10.1002/14651858.CD006962.pub2. Review.	1A:システムレビューまたはメタアナリシス	Systematic Review	(imaging ultrasound (US) or ultrasound Doppler (USD)) guided puncture techniques for insertion of central venous catheters via the internal jugular vein vs anatomical landmarks	Central Register of Controlled Trials (CENTRAL) (2013, Issue 1), MEDLINE (1966 to 15 January 2013), EMBASE (1966 to 15 January 2013), the Cumulative Index to Nursing and Allied Health Literature (CINAHL) (1982 to 15 January 2013), reference lists of articles, 'grey literature' and dissertations. An additional handsearch focused on intensive care and anaesthesia journals and abstracts and proceedings of scientific meetings. We attempted to identify unpublished or ongoing studies by contacting companies and experts in the field, and we searched trial registers. We reran the search in August 2014. We will deal with identified studies of interest when we update the review.	1:臨床アウトカム	Rate of total complications	On the basis of available data, we conclude that two-dimensional ultrasound offers small gains in safety and quality when compared with an anatomical landmark technique for subclavian (arterial puncture, haematoma formation) or femoral vein (success on the first attempt) cannulation for central vein catheterization. Data on insertion by inexperienced or experienced users, or on patients at high risk for complications, are lacking. The results for Doppler ultrasound techniques versus anatomical landmark techniques are uncertain.	Unknown	None	
9	Ultrasound assistance for central venous catheter placement in a pediatric emergency department improves placement success rates. Gallagher RA, Levy J, Vieira RL, Monuteaux MC, Stack AM. Acad Emerg Med. 2014 Sep;21(9):981-6. doi: 10.1111/acem.12460.	4:対照群のない観察研究	Retrospective cohort study	CVC using US assistance or CVC without US assistance	168 patients undergoing CVC placement attempts.	2:代替アウトカム	Success rate of CVC placement.	The proportion of successful placement attempts was significantly higher when using US assistance (96 of 98) compared to those without (55 of 70; 98% vs. 79%, odds ratio [OR] = 13.1, 95% confidence interval [CI] = 2.9 to 59.4). When controlling for patient- and physician-specific factors, success rates remained significantly higher. Ultrasound assistance was associated with greater likelihood of success in CVC placement in a pediatric ED.	Unknown	None	
10	Guidance and examination by ultrasound versus landmark and radiographic method for placement of subclavian central venous catheters: study protocol for a randomized controlled trial. Perbet S, Pereira B, Grimaldi F, Dualé C, Bazin JE, Constantin JM. Trials. 2014 May 20;15:175. doi: 10.1186/1745-6215-15-175.	1:無作為化比較試験	Randomized, controlled two-arm trial	Ultrasound real-time guidance and examination or landmark guidance and radiographic examination.	Investigators screen consecutive patients who are admitted to the ICU and require a central venous line. Inclusion criteria are requirement for SCV catheterization, age >18 years and informed consent from the patient or his/her next-of-kin. Exclusion criteria are patient refusal, femoral or internal jugular catheterization, and impossibility of obtaining good echogenicity.	2:代替アウトカム	The primary outcome is the time between the beginning of the procedure and control of the catheter. Secondary outcomes include the times required for the six components of the total procedure, the occurrence of complications (pneumothorax, hemothorax, or misplacement), failure of the technique and occurrence of central venous catheter infections.	The SUBGEUS trial is the first randomized controlled study to investigate whether ultrasound real-time guidance and examination for SCV catheter placement reduces all procedure times and the rate of complications.	Unknown	None	

	執筆者、題名、雑誌・書籍名、出版日	研究デザインのレベル	研究デザイン	介入の内容	対象者	アウトカムのレベル	アウトカムの指標	主な結果	活動・対策の短所	費用	その他
11	Comparison of an ultrasound-guided technique versus a landmark-guided technique for internal jugular vein cannulation. Dolu H, Goksu S, Sahin L, Ozen O, Eken L. J Clin Monit Comput. 2015 Feb;29(1):177-82. doi: 10.1007/s10877-014-9585-3. Epub 2014 May 18.	1:無作為化比較試験	RCT	Landmark-guided technique to the ultrasound-guided technique for internal jugular vein cannulation	One hundred cardiovascular surgery patients, of whom 65 were male and 35 were female with ages ranging from 22 to 65, who had internal jugular cannulation between December 2010-March 2011 in our clinic were investigated prospectively	2:代替アウトカム	The number of attempts until successful catheterization, the time required for successful catheterization, arising complications, the demographics and the duration of catheterization were recorded for each patient.	The number of attempts for successful catheterization was statistically lower in group U (1.1±0.5) than in group A (2.2±1.6). The time required for successful catheterization was statistically lower in group U (109.4±30.4) than in group A (165.9±91.5). There were no significant differences found in the total complications of the two groups (p=0.092). Four patients had an arterial puncture [group U (n=0) and group A (n=4)] and two patients had a hematoma [group U (n=1) and group A (n=1)]. Arterial puncture complication was increased significantly in landmark group (p=0.041). The findings of this study indicate that internal jugular vein catheterization guided by real-time ultrasound results in a lower access time and a lower rate of attempts.	Unknown	None	
12	Ultrasound- versus landmark-guided femoral catheterization in the pediatric catheterization laboratory: a randomized-controlled trial. Law MA, Borasino S, McMahon WS, Alten JA. Pediatr Cardiol. 2014 Oct;35(7):1246-52. doi: 10.1007/s00246-014-0923-5. Epub 2014 May 16.	1:無作為化比較試験	RCT	US- versus landmark (LM)-guided femoral vascular access	A single operator randomized 95 patients (201 vessels) to undergo either LM- or US-guided vascular access.	2:代替アウトカム	The primary end point was the access success rate. Number of attempts, inadvertent access, time to sheath placement, and complications also were compared between the two groups.	No difference was seen in the overall access success rate: 98 % with US versus 93 % with LM (p = 0.17). The success rate for the targeted vessel was higher with US (89 %) than with LM (67 %) (p = 0.012). US facilitated fewer attempts (1.1 ± 0.4 vs 1.4 ± 0.9; p = 0.048) and improved the first-attempt success rate (87 vs 77 %; p = 0.049). The time to access did not differ significantly between the two groups (US 2:55 ± 4:03 vs LM 3:37 ± 2:54; p = 0.28). No differences in complication rates were noted. The benefits of US were accentuated in the subgroup weighing less than 10 kg. In this study, US access in the pediatric catheterization laboratory did not improve overall success. However, US improved accuracy and reduced the number attempts necessary for access without prolonging the access time of the procedure. Small children realized the greatest benefit of US-guided access.	Unknown	None	
13	Pre-procedure ultrasound increases the success and safety of central venous catheterization. Schummer W, Köditz JA, Schelenz C, Reinhart K, Sakka SG. Br J Anaesth. 2014 Jul;113(1):122-9. doi: 10.1093/bja/aeu049. Epub 2014 Mar 18.	3:対照群のある観察研究	Observational non-randomized study	Pre-procedure US and landmark (LM) methods	606 of ~1300 procedures, that is, 200 patients were treated under pre-procedure US and 406 under LM [pathfinder (PF) n=202, direct cannulation (DC) n=204].	2:代替アウトカム	First needle pass success rate, success rate after the third attempt, and the cannulation time.	Pre-procedure US was associated with more successful attempts and shorter cannulation times. Under pre-procedure US, 88% of first attempts were successful and 100% of third attempts. The median (range) cannulation time was 39 (10-330) s. Under PF, only 56% of first, and 87% of third, attempts were successful with a median (range) cannulation time of 100 (25-3600) s. Under DC, 61% of first and 89% of third attempts were successful; the median (range) cannulation time was 70 (10-3600) s. Remarkably, inexperienced operators using pre-procedure US (n=38) were significantly faster than experienced operators using PF or DC (n=343) (cannulation time: median 60 s, range 12-330, for inexperienced; 60 s, range 10-3600, for experienced). First puncture success rates were higher (pre-procedure US, inexperienced 84%, PF or DC, experienced 57%). Pre-procedure US for IJV catheterization is safe, quick, and superior to LM.	Unknown	None	
14	The influence of the direction of J-tip on the placement of a subclavian catheter: real time ultrasound-guided cannulation versus landmark method, a randomized controlled trial. Oh AY, Jeon YT, Choi EJ, Ryu JH, Hwang JW, Park HP, Do SH. BMC Anesthesiol. 2014 Feb 28;14:11. doi: 10.1186/1471-2253-14-11.	1:無作為化比較試験	Prospective randomized controlled study	real-time ultrasound-guided infraclavicular subclavian venous cannulation or landmark method.	Sixty adult patients who required subclavian venous catheterization for neurosurgery	2:代替アウトカム	Incidence of unsuccessful guidewire placement, unsuccessful guidewire placements, the incidence of misplacement	The incidence of unsuccessful guidewire placement was lower in the ultrasound group than in the landmark group (13% vs. 47%, P=0.01). Among the unsuccessful guidewire placements, the incidence of misplacement were comparable between the groups and were all located in the ipsilateral internal jugular vein (7% vs. 7%). However, the incidence of advancement failure was significantly higher in landmark group (40% vs. 7%, P=0.005). There were no complications such as pneumothorax or hemothorax. The proper placement of guidewire was less influenced by the direction of the guidewire J-tip with ultrasound-guided subclavian venous cannulation than with the landmark approach.	Unknown	None	

	執筆者、題名、雑誌・書籍名、出版日	研究デザインのレベル	研究デザイン	介入の内容	対象者	アウトカムのレベル	アウトカムの指標	主な結果	活動・対策の短所	費用	その他
15	Residents learning ultrasound-guided catheterization are not sufficiently skilled to use landmarks. Maizel J, Guyomarc'h L, Henon P, Modeliar SS, de Cagny B, Choukroun G, Slama M. Crit Care. 2014 Feb 23;18(1):R36. doi: 10.1186/cc13741.	3: 対照群のある観察研究	Prospective observational study	Ultrasound-guided (UG) technique or landmark (LM) placement	During the first three months of their rotation in our ICU, residents inexperienced in CVC used only the real-time UG technique. During the following three months, residents were allowed to place CVC by means of the LM technique when authorized by the attending physician.	2: 代替アウトカム	Success rate, complication rate,	A total of 172 procedures (84 UG and 88 LM) were performed by the inexperienced residents during the study. The success rate was lower (72% versus 84%; P=0.05) and the complication rate was higher (22% versus 10%; P=0.04) for LM compared to UG procedures. Comparison between the five last UG procedures and the first five LM procedures performed demonstrated that the transition between the two techniques was associated with a marked decrease of the success rate (65% versus 93%; P=0.01) and an increase of the complication rate (33% versus 8%; P=0.01). After 10 LM procedures, residents achieved a success rate and a complication rate of 81% and 6%, respectively. Residents who only learn the UG technique will not be immediately able to perform the LM technique, but require specific training based on at least 10 LM procedures. The question of whether or not the LM technique should still be taught when an ultrasound device is not available must therefore be addressed.	Unknown	None	
16	Ultrasound-guidance can reduce adverse events during femoral central venous cannulation. Powell JT, Mink JT, Nomura JT, Levine BJ, Jasani N, Nichols WL, Reed J, Sierzenski PR. J Emerg Med. 2014 Apr;46(4):519-24. doi: 10.1016/j.jemermed.2013.08.023. Epub 2014 Jan 22.	3: 対照群のある観察研究	Prospective, observational study	Ultrasound-guidance and landmark techniques.	143 patients who had femoral CVC in our institution.	2: 代替アウトカム	CVC site, ultrasound usage, CVC indication, and mechanical complications (e.g., pneumothorax, arterial puncture, failed access, catheter misdirection, and hematoma).	Sixty CVCs (42%) were performed under ultrasound guidance, 83 (58%) via landmark technique (p = 0.0159); 3.3% of femoral central venous lines placed by ultrasound guidance had recorded adverse events compared with 9.6% for the landmark technique (p = 0.145). There was no statistically significant difference in complications between ultrasound-guidance and landmark techniques. Our data showed a trend toward decreased rates of arterial puncture and reduced cannulation attempts resulting in improved placement success. Our experience shows that ultrasound guidance for femoral CVC might decrease complications and improve placement success, although we cannot recommend this approach without additional data. We recommend a larger study to further evaluate this technique.	Unknown	None	
17	Achieving optimal clinical outcomes in ultrasound-guided central venous catheterizations of the internal jugular vein after a simulation-based training program for novice learners. Koh J, Xu Y, Yeo L, Tee A, Chuin S, Law J, Noor IB, Poulouse V, Raghuram J, Verma A, Ng A. Simul Healthc. 2014 Jun;9(3):161-6. doi: 10.1097/SIH.0000000000000010.	3: 対照群のある観察研究	Prospective, observational study	Simulation-based training program	32 residents participated in a formal training program, consisting of a simulation-based workshop and 5 supervised USG CVC insertions on patients.	2: 代替アウトカム	Data on the overall success (OS), first pass success (FP) and mechanical complication (MC) rates were serially collected over 2 years, spanning 4 cohorts of residents.	None had performed USG CVC before. Results showed that residents improved in their OS, FP, and MC rates as they performed more USG CVC. Residents needed to perform 7 USG CVCs to achieve optimal clinical outcomes of high OS and FP as well as low MC rates. There was a significant improvement in OS, FP, and MC rates for the eighth and subsequent USG CVCs compared with the first 7 USG CVCs (82% vs. 99% [P < 0.001], 70% vs. 92% [P < 0.001] and 11% vs. 0%, respectively). After a formal training program consisting of a simulation-based workshop and 5 supervised USG CVCs on critically ill adults, residents were able to achieve optimal clinical outcomes after performing 7 procedures.	Unknown	None	
18	Ultrasound-guided central venous cannulation is superior to quick-look ultrasound and landmark methods among inexperienced operators: a prospective randomized study. Airapetian N, Maizel J, Langelle F, Modeliar SS, Karakitsos D, Dupont H, Slama M. Intensive Care Med. 2013 Nov;39(11):1938-44. doi: 10.1007/s00134-013-3072-z. Epub 2013 Sep 12.	1: 無作為化比較試験	Prospective randomized single-center study.	Each inexperienced resident randomly inserted a central venous line using the UM, LM or UG technique.	A medical intensive care unit (ICU) of a university medical center. 118 patients requiring jugular or femoral central cannula placement.	2: 代替アウトカム	The primary outcome was the success rate, and secondary outcomes were the placement time, number of attempts, mechanical complication rate, and catheter colonization rate	The mean age of patients included in the study was 65 ± 15 years, and the mean Simplified Acute Physiology Score 2 (SAPS2) was 57 ± 20. The success rate was higher in the UG group than in the LM and UM groups (100, 74, and 73 %, respectively; p = 0.01). The total number of mechanical complications was higher in the LM and UM groups than in the UG group (24 and 36 versus 0 %, respectively; p = 0.01). The number of attempts and the access time were higher in the LM group than in the UG group, but not compared with the UM group. No difference in terms of catheter colonization was observed between the three groups. Ultrasound-guided cannulation of the internal jugular or femoral vein by inexperienced residents appears to be more reliable than the LM or UM methods and was associated with a lower mechanical complication rate among ICU patients.	Unknown	None	

	執筆者、題名、雑誌・書籍名、出版日	研究デザインのレベル	研究デザイン	介入の内容	対象者	アウトカムのレベル	アウトカムの指標	主な結果	活動・対策の短所	費用	その他
19	Ultrasound-guided cannulation of the internal jugular vein in robotic cardiac surgery. Wang Y, Wang G, Gao CQ. Chin Med J (Engl). 2013 Jul;126(13):2414-7.	3: 対照群のある観察研究	Historical control study	Ultrasound-guided cannulation of the IJV vs landmark	296 adult patients undergoing ultrasound-guided right IJV cannulation during establishment of peripheral CPB in robotic cardiac surgery. landmark-guided method used for 302 historical control patients	2: 代替アウトカム	Success rate, first attempt success rate, access time and the complication rate	The success rate and the first attempt success rate in the ultrasound group were significantly higher than that in the landmark group (100% vs. 88.1%, $P < 0.000$ and 98.6% vs. 38.4%, $P < 0.000$). Average access time in the ultrasound group was shorter than that in the landmark group ((6.3 ± 13.6) seconds; interquartile range (4 - 62) seconds vs. (44.5 ± 129.5) seconds; interquartile range (5 - 986) seconds). The complication rate in the ultrasound group was significantly lower than that in the landmark group (0.3% vs. 8.3%, $P < 0.000$). Compared with the landmark-guided approach, ultrasound-guided cannulation of the right IJV significantly improves success rate, decreases access time and reduces complication rate during establishment of peripheral CPB in robotic cardiac surgery.	Unknown	None	
20	A prospective randomized trial of ultrasound- vs landmark-guided central venous access in the pediatric population. Bruzoni M, Slater BJ, Wall J, St Peter SD, Dutta S. J Am Coll Surg. 2013 May;216(5):939-43. doi: 10.1016/j.jamcollsurg.2013.01.054. Epub 2013 Mar 7.	1: 無作為化比較試験	Randomized prospective study	Ultrasound-guided cannulation of the IJV vs landmark	150 children under 18 years of age undergoing tunneled central venous catheter placement was performed. Patient accrual was based on power analysis. Exclusion criteria included known nonpatency of a central vein or coagulopathy.	2: 代替アウトカム	The primary outcomes measure was number of attempts at venous cannulation. Secondary outcomes measures included: access times, number of arterial punctures, and other complications.	There was no difference when comparing demographic data. Success at first attempt was achieved in 65% of patients in the ultrasound group vs 45% in the landmark group ($p = 0.021$). Success within 3 attempts was achieved in 95% of ultrasound group vs 74% of landmark group ($p = 0.0001$). Ultrasound reduced the number of cannulation attempts necessary for venous access. This indicates a potential to reduce complications when ultrasound is used by pediatric surgeons.	Unknown	None	