**Appendix 1: Society of Hospital Medicine Point-of-care Ultrasound Task Force**

Chairs

Nilam Soni

Ricardo Franco

Jeff Bates

Working Groups

Credentialing

Brian P Lucas (chair)

David Tierney

Trevor Prosch Jensen

Thoracentesis

Ria Dancel (chair)

Daniel Schnobrich

Nitin Puri

Vascular Access

Ricardo Franco (chair)

Benji Mathews

Saaid Abdel-Ghani

Sophia Rodgers

Martin Perez

Daniel Schnobrich

Ria Dancel

Paracentesis

Joel Cho (chair)

Benji Matthews

Kreegan Reierson

Anjali Bhagra

Lumbar puncture

Nilam Soni (chair)

Ricardo Franco

Gerard Salame

Josh Lenchus

Venkat Kalidindi

Ketino Kobaidze

Peer Reviewers

Paul Mayo

Michael Blaivas

Richard Hoppmann

Kirk Spencer

Vicki Noble

Vivek Tayal

Robert Arntfield

Aliaksei Pustavoitau

Methodologist

Mahmoud El Barbary

Librarian

Loretta Grikis

SHM Education Committee

Satyen Nichani (chair)

Dan Brotman

Susan Hunt

SHM Staff

Nick Marzano

**Appendix 2:** Conflict of Interest Disclosures of SHM Point-of-care Ultrasound Task Force

| **Task Force Member** | **Disclosure** | **Company** | **Relationship** | **Related to project** |
| --- | --- | --- | --- | --- |
| **Chairs** |  |  |  |  |
| Jeff Bates | No | -- | -- | -- |
| Ricardo Franco | No | -- | -- | -- |
| Nilam Soni | Yes | Elsevier-Saunders | Royalty | No |
| **Writing Groups Members** |  |  |  |  |
| Saaid Abdel-Ghani | No | -- | -- | -- |
| Anjali Bhagra | No | -- | -- | -- |
| Carolina Candotti | No | -- | -- | -- |
| Joel Cho | No | -- | -- | -- |
| Ria Dancel | No | -- | -- | -- |
| Trevor Jensen | No | -- | -- | -- |
| Venkat Kalidindi | No | -- | -- | -- |
| Ketino Kobaidze | No | -- | -- | -- |
| Josh Lenchus | No | -- | -- | -- |
| Brian Lucas | No | -- | -- | -- |
| Benji Mathews | No | -- | -- | -- |
| Martin Perez | No | -- | -- | -- |
| Nitin Puri | Yes | Elsevier  Fujifilm-Sonosite | Honorarium  Honorarium | No  No |
| Kreegan Reierson | No | -- | -- | -- |
| Sophia Rodgers | No | -- | -- | -- |
| Gerard Salame | No | -- | -- | -- |
| Dan Schnobrich | No | -- | -- | -- |
| David Tierney | No | -- | -- | -- |
| **Peer Reviewers** |  |  |  |  |
| Robert Arntfield | Yes | Fujifilm-Sonosite | Honorarium | No |
| Michael Blaivas | Yes | GE Healthcare  Analogic | Consultant  Consultant | No  No |
| Mahmoud ElBarbary | No | -- | -- | -- |
| Richard Hoppmann | No | -- | -- | -- |
| Paul Mayo | No | -- | -- | -- |
| Vicki Noble | No | -- | -- | -- |
| Aliaksei Pustavoitau | No | -- | -- | -- |
| Kirk Spencer | No | -- | -- | -- |
| Vivek Tayal | No | -- | -- | -- |
| **Methodologist** |  |  |  |  |
| Mahmoud El-Barbary | No | -- | -- | -- |
| **Medical Librarian** |  |  |  |  |
| Loretta Girikis | No | -- | -- | -- |
| **SHM Education Committee** |  |  |  |  |
| Satyen Nichani | No | -- | -- | -- |
| Daniel Brotman | No | -- | -- | -- |
| Susan Hunt | No | -- | -- | -- |
| **SHM Staff** |  |  |  |  |
| Nick Marzano | No | -- | -- | -- |

**Appendix 3:** Literature Search Strings

Three literature searches were conducted in February 2016, October 2016, and January 2017. The first literature search focused on credentialing, and the second and third searches focused on hospital privileging and competency. The search strategies were complementary, and the search strings are listed below.

**Literature Search #1: February and October 2016**

**PubMed search strings:**

Thoracentesis:

(“Thoracentesis”[Mesh] OR thoracentesis[tiab] OR thoracic[tiab] OR "pleural effusion\*"[tiab] OR "pleural drainage"[tiab] OR "pleural fluid analysis"[tiab] OR "tube thoracostomy"[tiab] OR pleuracentesis[tiab] OR pleurocentesis[tiab] OR thoracocentesis[tiab]) AND ("Ultrasonography"[Mesh] OR "Radiography"[Mesh] OR imaging [tiab] OR sonograph\*[tiab] OR echograph\*[tiab] OR echocardiograph\*[tiab] OR "thoracic ultrasound"[tiab]) AND (credential\* OR privileg\*)

Paracentesis:

("Paracentesis"[Mesh] OR paracentesis[tiab] OR "Ascitic Fluid"[Mesh] OR "peritoneal drainage"[tiab] OR "peritoneal fluid"[tiab]) AND ("Ultrasonography"[Mesh] OR ultrasound[tiab] OR sonograph\*[tiab] OR echograph\*[tiab] OR echocardiograph\*[tiab]) AND (credential\* OR privileg\*)

Arthrocentesis:

("Arthrocentesis"[Mesh]) OR arthrocentesis[tiab] OR arthrocenteses[tiab] OR "joint aspiration"[tiab] OR "synovial fluid"[tiab] OR "musculoskeletal aspiration"[tiab] AND ("Ultrasonography"[Mesh] OR "Radiography"[Mesh] OR imaging[tiab] OR sonograph\*[tiab] OR ultrasonic[tiab]) AND (credential\* OR privileg\*)

Emergency Procedures:

("Emergencies"[Mesh] OR "Emergency Nursing"[Mesh] OR "Emergency Treatment"[Mesh] OR "Emergency Service, Hospital"[Mesh] OR "Evidence-Based Emergency Medicine"[Mesh] OR "Emergency Medicine"[Mesh] OR "Emergency Medical Services"[Mesh] OR emergency[tiab] OR emergencies[tiab]) AND ("Pericardiocentesis"[Mesh] OR pericardiocentesis[tiab] OR pericard\*[tiab] OR "Pneumothorax"[Mesh] OR pneumothorax[tiab] OR "collapsed lung"[tiab] OR "lung collapse"[tiab]) AND ("Ultrasonography"[Mesh] OR ultrasound[tiab] OR "Radiography"[Mesh] OR ultrasound[tiab] OR imaging[tiab] OR sonograph\*[tiab] OR ultrasonic[tiab]) AND (credential\* OR privileg\*)

Vascular Access Procedures:

("Vascular Access Devices"[Mesh] OR "Central Venous Catheters"[Mesh] OR "Catheterization, Peripheral"[Mesh] OR "vascular catheter"[tiab] OR "central venous access"[tiab] OR "central line"[tiab] OR "peripheral vernous access"[tiab] OR "central venous catheter"[tiab] OR "peripheral venous catheter"[tiab] OR "arterial access"[tiab] OR "port catheter"[tiab] OR "venous access"[tiab] OR "Port-A-Cath"[tiab] OR "arterial lines"[tiab] OR "intra-arterial lines"[tiab] OR PICC[tiab] OR "peripherally inserted central catheter"[tiab]) AND ("Ultrasonography"[Mesh] OR "Radiography"[Mesh] OR ultrasound[tiab] OR imaging[tiab] OR sonograph\*[tiab] OR ultrasonic[tiab]) sonograph\*[tiab] OR ultrasonic[tiab]) AND (credential\* OR privileg\*)

Lumbar Puncture:

("Spinal Puncture"[Mesh] OR "lumbar puncture"[tiab] OR "spinal tap"[tiab] OR "spinal block"[tiab] OR "spinal anesthesia"[tiab] OR "spinal anaesthesia"[tiab] OR "caudal block"[tiab] OR "epidural anesthesia"[tiab] OR "epidural anaesthesia"[tiab] OR "epidural injection"[tiab] OR "Anesthesia, Spinal"[Mesh] OR "Injections, Spinal"[Mesh] OR "Anesthesia, Epidural"[Mesh]) OR "Injections, Epidural"[Mesh] AND ("Ultrasonography"[Mesh] OR "Radiography"[Mesh] OR imaging[tiab] OR sonograph\*[tiab] OR echograph\*[tiab] OR Doppler[tiab] OR echocardiograph\*[tiab] OR ultrasonic[tiab]) AND (credential\* OR privileg\*)

Bedside Ultrasound:

(Bedside[tiab] OR pocket[tiab] OR handheld[tiab] OR “Point of Care”[tiab]) AND ("Ultrasonography"[Mesh] OR "Radiography"[Mesh] OR imaging[tiab] OR sonograph\*[tiab] OR ultrasonic[tiab])AND (credential\*OR privileg\*)

**Embase search strings:**

Thoracentesis:

('thoracocentesis'/exp OR 'thoracocentesis' OR thoracentesis:ti OR thoracic:ti OR 'pleural effusion':ti OR 'pleural drainage':ti OR 'pleural fluid analysis':ti OR 'tube thoracostomy':ti OR pleuracentesis:ti OR pleurocentesis:ti OR thoracocentesis:ti ) AND ('ultrasound'/exp OR 'ultrasound' OR ultrasound:ti OR ultrasonography:ti OR radiography:ti OR imaging:ti OR sonograph:ti OR sonography:ti OR echography:ti OR echocardiograph:ti OR echocardiography:ti OR 'thoracic ultrasound':ti) AND (credential\* OR privileg\*)

Paracentesis:

("Paracentesis"/mj OR paracentesis:ti OR "Ascitic Fluid"”ti OR "peritoneal drainage":ti OR "peritoneal fluid":ti) AND ("Ultrasonography”/mj OR ultrasound:ti OR sonograph\*:ti OR echograph\*:ti OR echocardiograph\*:ti) AND (credential\* OR privileg\*)

Arthrocentesis:

'arthrocentesis'/exp OR 'joint aspiration'/exp OR arthrocentesis:ti OR arthrocenteses:ti OR 'joint aspiration':ti OR 'synovial fluid':ti OR 'musculoskeletal aspiration':ti AND ('ultrasound'/exp OR ultrasonography:ti OR 'radiography'/mj OR imaging:ti OR sonograph\*:ti OR ultrasonic:ti) AND (credential\* OR privileg\*)

Emergency Procedures:

'emergency'/exp OR 'emergency nursing'/exp OR 'emergency treatment'/exp OR 'emergency health service'/exp OR 'evidence based emergency medicine'/exp OR 'emergency medicine'/exp AND 'emergency medicine'/exp OR 'emergency health service'/exp OR emergency:ti OR emergencies:ti AND ('pericardiocentesis'/exp OR pericardiocentesis:ti OR 'pneumothorax'/exp OR pneumothorax:ti OR ‘collapsed lung':ti OR OR 'lung collapse':ti) AND ('ultrasound'/exp OR 'radiography'/exp OR ultrasound:ti OR sonography:ti OR ultrasonic:ti) AND (credential\* OR privileg\*)

Lumbar Puncture:

('lumbar puncture'/mj OR 'lumbar puncture':ti OR 'spinal puncture':ti OR 'spinal tap':ti OR 'spinal block':ti OR 'spinal anesthesia'/exp OR 'spinal anesthesia':ti OR 'spinal anaesthesia':ti OR 'caudal anesthesia'/exp OR 'epidural anesthesia':ti OR 'epidural injection':ti OR 'intraspinal drug administration'/mj OR 'epidural anesthesia'/mj OR 'spinal injections':ti) AND ('ultrasound'/mj OR ultrasonography:ti OR ultrasound:ti OR radiography:ti OR sonograph\*:ti OR echograph\*:ti OR echocardiography\*:ti OR ultrasonic:ti)AND (credential\* OR privileg\*)

Vascular Access:

('catheterization'/mj OR 'intravascular catheter'/mj OR 'peripheral venous catheter'/mj OR 'central venous catheter'/mj OR 'peripherally inserted central venous catheter'/mj OR 'vascular catheter':ti OR 'central venous access':ti OR 'peripheral venous access':ti OR 'central venous catheter':ti OR 'peripheral venous catheter':ti OR 'arterial access':ti OR 'port catheter':ti OR 'venous access':ti OR 'port a cath':ti OR 'arterial line':ti OR OR 'intra-arterial line':ti OR picc) AND ('ultrasound'/mj OR ultrasonography:ti OR ultrasound:ti OR 'radiography'/mj OR imaging:ti OR sonography:ti OR ultrasonic:ti)AND (credential\* OR privileg\*)

Bedside Ultrasound:

(bedside:ti OR pocket:ti OR handheld:ti OR “Point of Care”:ti) AND (ultrasonography:ti OR ultrasonography/exp OR ultrasound:ti OR radiography:ti OR sonograph\*:ti OR ultrasonic:ti) AND (credential\* OR privileg\*)

**CINAHL Search Strings:**

Thoracentesis:

(MH "Thoracentesis" OR thoracentesis(ti) OR thoracic(ti) OR "Pleural effusion"(ti) OR "pleural drainage"(ti) OR "Pleural fluid analysis"(ti) OR "tube thoracostomy"(ti) OR pleuracentesis(ti) OR pleurocentesis(ti) OR thoracocentesis(ti))AND (ultrasonography(ti) OR ultrasound(ti) OR radiography(ti) OR imaging(ti) OR sonography(ti) OR echograph(ti) OR echography(ti) OR echocardiograph(ti) OR "thoracic ultrasound"(ti)) AND (credential\* OR privileg\*)

Paracentesis:

(MH "Paracentesis" OR paracentesis(ti )OR paracenteses(ti) OR MH "Ascitic Fluid" OR "peritoneal drainage"(ti) OR "peritoneal fluid"(ti))AND (ultrasonography(ti ) OR ultrasound(ti) OR MH “Ultrasound” OR sonograph\*(ti) OR echograph\*(ti) OR echocardiograph\*(ti)) AND (credential\*OR privileg\*)

Arthrocentesis:

(MH "Arthrocentesis" OR arthrocentesis(ab) OR arthrocenteses(ab) OR "joint aspiration"(ab) OR "synovial fluid"(ab) OR musculoskeletal aspiration"(ab)) AND (MH "Ultrasonography" OR ultrasound(ab) OR imaging(ab) OR sonograph\*(ab) OR radiography(ab) OR ultrasonic(ab))AND (credential\* OR privileg\*)

Emergency Procedures:

(MH "Pericardiocentesis" OR "pericardiocentesis"(ti) OR MH "Pneumothorax"OR "pneumothorax"(ti)) AND (MH "Emergency Nursing" OR MH "Emergency Care" OR MH "Emergency Medicine" OR MH "Emergency Service" OR MH "Emergency Treatment" OR MH "Emergency Patients" OR emergency(ti) OR "collapsed lung"(ti) OR "lung collapse"(ti))AND (MH "Ultrasonography" OR ultrasound(ti) OR radiography(ti) OR sonography(ti) OR ultrasonic(ti))AND (credential\* OR privileg\*)

Lumbar Puncture:

((MH "Spinal Puncture") OR (MH "Anesthesia, Spinal") OR (MH "Anesthesia, Epidural") OR (MH "Injections, Epidural") OR "lumbar puncture" OR "spinal puncture" OR "spinal tap" OR "spinal block" OR "caudal anesthesia" OR "caudal block" OR "epidural injection" OR "spinal injection") AND ((MH "Ultrasound") OR ultrasonography OR ultrasound OR radiography OR echography OR sonography OR Doppler OR echocardiograph\* OR ultrasonic) AND credential\*

Vascular Access:

(MH "Vascular Access Devices" OR (MH "Central Venous Catheters" OR MH "Peripherally Inserted Central Catheters" OR MH "Catheters, Vascular" OR MH "Catheterization, Peripheral Central Venous" OR MH "Catheterization, Central Venous" OR "vascular access device\*" (ti) OR "central venous catheter\*"(ti) OR "vascular catheter\*"(ti) OR "central venous access"(ti) OR "central line\*"(ti) OR "peripheral venous access"(ti) OR "central venous catheter\*"(ti) OR "peripheral venous catheter\*"(ti) OR "arterial access"(ti) OR "port catheter\*"(ti) OR "venous access"(ti) OR Port-A-Cath(ti) OR "arterial line\*"(ti) OR intra-arterial line\*"(ti) OR PICC(ti)) AND (ultrasonography(ti) OR ultrasound(ti) OR radiography (ti) OR imaging(ti) OR sonograph\*(ti)OR ultrasonic(ti)) AND (credential\*OR privileg\*)

Bedside Ultrasound

(bedside:ti OR pocket:ti OR handheld:ti OR “Point of Care”:ti) AND (ultrasonography:ti OR ultrasound:ti OR radiography:ti OR sonograph\*:ti OR ultrasonic:ti) AND (credential\*OR privileg\*)

**Cochrane and Google Scholar Search Strings:**

Thoracentesis:

(thoracentesis OR thoracic OR "Pleural effusion" OR "pleural drainage" OR "Pleural fluid analysis" OR "tube thoracostomy" OR pleuracentesis OR pleurocentesis OR thoracocentesis) AND (ultrasonography OR ultrasound OR radiography OR imaging OR sonography OR echograph OR echography OR echocardiograph OR "thoracic ultrasound")AND (credential\* OR privileg\*)

Paracentesis:

(Paracentesis OR paracenteses OR “ascitic fluid” OR “peritoneal drainage” OR “peritoneal fluid”) AND (ultrasonography OR ultrasound OR sonograph\* OR echograph\* OR echocardiograph\*) AND (credential\* OR privileg\*)

Arthrocentesis:

(arthrocentesis or arthrocenteses or "joint aspiration" or "synovial fluid" or "musculoskeletal aspiration") and (ultrasonography or ultrasound or radiography or imaging or sonography or ultrasonic) AND (credential\* OR privileg\*)

Emergency Procedures:

(emergency OR emergencies) AND (pericardiocentesis OR pericard\* OR pneumothorax OR "collapsed lung" OR "lung collapse") AND (ultrasound OR radiography OR imaging OR sonograph\* OR ultrasonic) AND (credential\* OR privileg\*)

Lumbar Puncture:

("spinal Puncture" OR "lumbar puncture" OR "spinal tap" OR "spinal block" OR "spinal anesthesia" OR "spinal anaesthesia" OR "caudal block"OR "epidural anesthesia" OR "epidural anaesthesia" OR "epidural injection" OR "spinal anesthesia" OR "spinal injections" OR "epidural injections") AND (Ultrasonography OR Radiography OR ultrasound OR imaging OR sonograph\* OR echograph\* OR Doppler OR echocardiograph\* OR ultrasonic) AND (credential\*OR privileg\*)

Vascular Access:

(catheterization or "intravascular catheter" or "peripheral venous catheter" or "peripherally inserted central venous catheter" or "vascular catheter" or "central venous access" or "peripheral venous access" or "central venous catheter" or "peripheral venous catheter" or "arterial access" or "port catheter" or "venous access" or "port a cath" or "arterial line" or "intra-arterial line" or PICC) and (ultrasound or ultrasonography or radiograph\* or imaging or sonograph\* or ultrasonic) AND (credential\* OR privileg\*)

Bedside Ultrasound;

(“point of care” OR bedside OR handheld OR pocket) AND (ultrasonography OR radiography OR imaging OR image OR sonograph\* OR ultrasonic) AND (credential\* OR privileg\*)

**Literature Search #2: January 2017**

**PubMed search:**

("Arthrocentesis"[Mesh] OR arthrocentesis[tiab] OR OR arthrocenteses[tiab] OR "Paracentesis"[Mesh] OR paracentesis[tiab] OR "Thoracentesis"[Mesh] OR thoracentesis[tiab] OR "Spinal Puncture"[Mesh] OR "lumbar puncture"[tiab] OR "vascular access"[tiab] OR "joint aspiration"[tiab] OR "synovial fluid"[tiab] OR "musculoskeletal aspiration"[tiab] OR thoracic[tiab] OR "pleural effusion\*"[tiab] OR "pleural drainage"[tiab] OR "pleural fluid analysis"[tiab] OR "tube thoracostomy"[tiab] OR pleuracentesis[tiab] OR pleurocentesis[tiab] OR thoracocentesis[tiab] OR "Ascitic Fluid"[Mesh] OR "peritoneal drainage"[tiab] OR "peritoneal fluid"[tiab] OR "Emergencies"[Mesh] OR "Emergency Nursing"[Mesh] OR "Emergency Treatment"[Mesh] OR "Emergency Service, Hospital"[Mesh] OR "Evidence-Based Emergency Medicine"[Mesh] OR "Emergency Medicine"[Mesh] OR "Emergency Medical Services"[Mesh] OR emergency[tiab] OR emergencies[tiab] OR "Vascular Access Devices"[Mesh] OR "Central Venous Catheters"[Mesh] OR "Catheterization, Peripheral"[Mesh] OR "vascular catheter"[tiab] OR "central venous access"[tiab] OR "central line"[tiab] OR "peripheral venous access"[tiab] OR "central venous catheter"[tiab] OR "peripheral venous catheter"[tiab] OR "arterial access"[tiab] OR "port catheter"[tiab] OR "venous access"[tiab] OR "Port-A-Cath"[tiab] OR "arterial lines"[tiab] OR "intra-arterial lines"[tiab] OR PICC[tiab] OR "peripherally inserted central catheter"[tiab] OR "spinal tap"[tiab] OR "spinal block"[tiab] OR "spinal anesthesia"[tiab] OR "spinal anaesthesia"[tiab] OR "caudal block"[tiab] OR "epidural anesthesia"[tiab] OR "epidural anaesthesia"[tiab] OR "epidural injection"[tiab] OR "Anesthesia, Spinal"[Mesh] OR "Injections, Spinal"[Mesh] OR "Anesthesia, Epidural"[Mesh] OR "Injections, Epidural"[Mesh] OR "Pericardiocentesis"[Mesh] OR pericard\*[tiab] OR "Pneumothorax"[Mesh] OR pneumothorax[tiab] OR "collapsed lung"[tiab] OR "lung collapse"[tiab]) AND ("Ultrasonography"[Mesh] OR "Radiography"[Mesh] OR imaging [tiab] OR sonograph\*[tiab] OR echograph\*[tiab] OR echocardiograph\*[tiab] OR "thoracic ultrasound"[tiab] OR ultrasound[ti]) AND (privil\* OR competen\* OR credential\*)

**Embase search:**

(Arthrocentesis/mj OR arthrocentesis:ti OR arthrocenteses:ti OR Paracentesis/mj OR paracentesis:ti OR Thoracentesis/mj OR thoracentesis:ti OR "Spinal Puncture"/mj OR "lumbar puncture":ti OR "vascular access":ti OR "joint aspiration":ti OR "synovial fluid":ti OR "musculoskeletal aspiration":ti OR thoracic:ti OR "pleural effusion":ti OR "pleural drainage":ti OR "pleural fluid analysis"[tiab] OR "tube thoracostomy":ti OR pleuracentesis:ti OR pleurocentesis:ti OR thoracocentesis:ti OR "Ascitic Fluid”/mj OR "peritoneal drainage":ti OR "peritoneal fluid":ti OR "Emergencies"/mj OR "Emergency Nursing"/mj OR "Emergency Treatment"/mj OR "Emergency Service, Hospital"/mj OR "Evidence-Based Emergency Medicine"/mj OR "Emergency Medicine"/mj OR "Emergency Medical Services"/mj OR emergency:ti OR emergencies:ti OR "Vascular Access Devices"/mj OR "Central Venous Catheters"/mj OR "Catheterization, Peripheral”/mj OR "vascular catheter":ti OR "central venous access":ti OR "central line":ti OR "peripheral venous access":ti OR "central venous catheter":ti OR "peripheral venous catheter":ti OR "arterial access":ti OR "port catheter":ti OR "venous access":ti OR "Port-A-Cath":ti OR "arterial lines":ti OR "intra-arterial lines":ti OR PICC:ti OR "peripherally inserted central catheter":ti OR "spinal tap":ti OR "spinal block":ti OR "spinal anesthesia":ti OR "spinal anaesthesia":ti OR "caudal block":ti OR "epidural anesthesia":ti OR "epidural anaesthesia":ti OR "epidural injection":ti OR "Anesthesia, Spinal"/mj OR "Injections, Spinal"/mj OR "Anesthesia, Epidural”/mj OR "Injections, Epidural"/mj OR "Pericardiocentesis"/mj OR pericard\*:ti OR "Pneumothorax"/mj OR pneumothorax:ti OR "collapsed lung":ti OR "lung collapse":ti) AND ("Ultrasonography"/mj OR "Radiography"/mj OR imaging:ti OR sonograph\*:ti OR echograph\*:ti OR echocardiograph\*:ti OR "thoracic ultrasound":ti OR ultrasound:ti) AND (privil\*:ab,ti OR competen\*:ab,ti OR credential\*:ab,ti)

**Cochrane and Google Scholar search:**

In title, abstract, keyword:

(arthrocentesis OR paracentesis OR thoracentesis OR “lumbar puncture” OR “vascular access” OR emergency OR “joint aspiration” OR “synovial fluid” OR “musculoskeletal aspiration” OR thoracic OR “pleural effusion” OR “pleural effusion” OR “pleural drainage” OR “pleural fluid” OR “tube thoracostomy” OR pleuracentesis OR pleurocentesis OR thoracocentesis OR “ascitic fluid” OR peritoneal drainage” OR emergency OR emergencies OR “vascular access” OR “vascular catheter” OR “central venous access” OR “central line” OR “peripheral venous access” OR “central venous catheter” OR “peripheral venous catheter” OR “arterial access” OR “port catheter” OR “venous access” OR Port-A-Cath OR “arterial lines” OR “intra-arterial lines” OR PICC OR “peripherally inserted central catheter” OR “spinal puncture” OR "lumbar puncture” OR "spinal tap" OR "spinal block" OR "spinal anesthesia" OR "spinal anaesthesia" OR "caudal block" OR "epidural anesthesia" OR "epidural anaesthesia" OR "epidural injection" OR “spinal injections” OR “spinal anesthesia” OR epidural OR pericardiocentesis OR pneumothorax OR lung) AND (ultrasound OR ultrasonography OR radiography OR imaging OR sonograph\* OR echograph\* OR echocardiograph\* OR “thoracic ultrasound”) AND (privileg\* OR competen\* OR credential\*)

**CINAHL search:**

(MH "Arthrocentesis” OR arthrocentesis OR arthrocenteses OR MH "Paracentesis" OR paracentesis OR MH "Thoracentesis" OR thoracentesis OR MH "Spinal Puncture" OR "lumbar puncture” OR "vascular access"OR emergency(ti) OR "joint aspiration" OR "synovial fluid" OR "musculoskeletal aspiration" OR thoracic OR "pleural effusion\*"OR "pleural drainage" OR "pleural fluid analysis" OR "tube thoracostomy" OR pleuracentesis OR pleurocentesis OR thoracocentesis OR MH "Ascitic Fluid” OR "peritoneal drainage" OR "peritoneal fluid" OR MH "Emergencies"OR MH"Emergency Nursing" OR MH"Emergency Service, Hospital" OR MH "Emergency Medicine"[Mesh] OR MH"Emergency Medical Services" OR emergency(ti) OR emergencies(ti) OR "Vascular Access Devices"[Mesh] OR "Central Venous Catheters"[Mesh] OR "Catheterization, Peripheral"[Mesh] OR "vascular catheter" OR "central venous access" OR "central line" OR "peripheral venous access" OR "central venous catheter" OR "peripheral venous catheter" OR "arterial access" OR "port catheter" OR "venous access” OR "Port-A-Cath"OR "arterial line\*" OR "intra-arterial line\*” OR PICC OR "peripherally inserted central catheter" OR "Spinal Puncture"[Mesh] OR "lumbar puncture" OR "spinal tap" OR "spinal block” OR "spinal anesthesia" OR "spinal anaesthesia" OR "caudal block" OR "epidural anesthesia" OR "epidural anaesthesia" OR "epidural injection" OR MH "Anesthesia, Spinal" OR "Injections, Spinal" OR "Anesthesia, Epidural" OR "Injections, Epidural" OR "Pericardiocentesis" OR pericard\* OR "Pneumothorax" OR pneumothorax OR "collapsed lung" OR "lung collapse" AND (MH"Ultrasonography" OR MH"Radiography" OR imaging OR sonograph\* OR echograph\* OR echocardiograph\* OR "thoracic ultrasound" OR ultrasound) AND (privil\* OR competen\* OR credential\*)