Supplemental materials for:

Andersen CA, Holden S, Vela J, Rathleff M, Jensen M. Point-of-care ultrasound in general practice: a systematic review. *Ann Fam Med*. 2019;17(1):61-69.

Supplemental Appendix 1. Search string

Point-of-care ultrasound in general practice: A systematic review

This appendix includes a full description of the literature search conducted in MEDLINE via PubMed, EMBASE via OVID, CINAHL via Ebsco, Web of Science, and Cochrane Central Register of Controlled Trials (CENTRAL) on May 12th 2016 and updated on august 21st 2017. The search was conducted by the principal investigator (Camilla Aakjær Andersen) and a medical librarian at the medical library at Aalborg University Hospital, Aalborg, Denmark. All databases were searched from inception date until august 21th 2017.

Database	Interface	Number of hits 12.05.2016	Number of hits 21.08.2017
MEDLINE	Pubmed	2337	242
EMBASE	OVID	4219	567
CINAHL	Ebsco	393	41
Web of Science		2787	434
Cochrane		253	104

MEDLINE 12.05.16 (updated 21.08.2017)

Interface: Pubmed

ecent queries

Search	Add to builder	Query	Items found	Time
#19	Add	Search **((((((((((((("Private Practice"[Mesh]) OR "General Practice"[Mesh]) OR "Primary Health Care"[Mesh]) OR "General Practitioners"[Mesh]) OR "Physicians, Family"[Mesh]) OR "Physicians, Primary Care"[Mesh]) OR ("Primary Care Physician"[tw] OR "Primary Care Physicians"[tw])) OR ("General Practice"[tw] OR "General Practitioner"[tw] OR "General Practitioners"[tw])) OR ("Family Physician"[tw] OR "Family Physicians"[tw])) OR "Primary Health Care"[tw]) OR ("Family Practitioner"[tw] OR "Family Practice"[tw] OR "Family Practitioners"[tw])) OR ("family medicine practice"[tw] OR "family medicine practitioner"[tw] OR "family medicine practitioners"[tw])) OR ("private practice"[tw] OR "private practitioner"[tw] OR "private practitioners"[tw]))) AND (("Ultrasonography"[Mesh]) OR (Ultraso*[tw] OR sonograph*[tw] OR echograph*[tw]))**	2337	04:48:37
#18	Add	Search **("Ultrasonography"[Mesh]) OR (Ultraso*[tw] OR sonograph*[tw] OR echograph*[tw])**	517866	04:35:14
#17	Add	Search **Ultraso*[tw] OR sonograph*[tw] OR echograph*[tw]**	458529	04:35:07
#16	Add	Search **"Ultrasonography"[Mesh]**	269767	04:34:15
#15	Add	Search **((((((((((("Private Practice"[Mesh]) OR "General Practice"[Mesh]) OR "Primary Health Care"[Mesh]) OR "General Practitioners"[Mesh]) OR "Physicians, Family"[Mesh]) OR "Physicians, Primary Care"[Mesh]) OR ("Primary Care Physician"[tw] OR "Primary Care Physicians"[tw])) OR ("General Practice"[tw] OR "General Practitioner"[tw] OR "General Practitioners"[tw])) OR ("Family Physician"[tw] OR "Family Physicians"[tw])) OR "Primary Health Care"[tw]) OR ("Family Practitioner"[tw] OR "Family Practice"[tw] OR "Family Practitioners"[tw])) OR ("family medicine practice"[tw] OR "family medicine practitioner"[tw] OR "family medicine practitioners"[tw])) OR ("private practice"[tw] OR "private practitioner"[tw] OR "private practitioners"[tw])**	259026	04:33:55
#14	Add	Search **"private practice"[tw] OR "private practitioner"[tw] OR "private practitioners"[tw]**	13837	04:32:58
#13	Add	Search **"family medicine practice"[tw] OR "family medicine practitioner"[tw] OR "family medicine practitioners"[tw]**	168	04:32:06
#12	Add	Search **"Family Practitioner"[tw] OR "Family Practice"[tw] OR "Family Practitioners"[tw]**	66195	04:31:01
#11	Add	Search **"Primary Health Care"[tw]**	70189	04:29:55
#10	Add	Search **"Family Physician"[tw] OR "Family Physicians"[tw]**	25064	04:29:34
#9	Add	Search **"General Practice"[tw] OR "General Practitioner"[tw] OR "General Practitioners"[tw]**	71834	04:28:50
#8	Add	Search **"Primary Care Physician"[tw] OR "Primary Care Physicians"[tw]**	16496	04:27:23
#7	Add	Search **"Physicians, Primary Care"[Mesh]**	1811	04:25:03
#6	Add	Search **"Physicians, Family"[Mesh]**	15326	04:24:46

ecent queries

Search	Add to builder	Query	Items found	Time
#5	Add	Search **"General Practitioners"[Mesh]**	4640	04:24:33
#4	Add	Search **"Primary Health Care"[Mesh]**	113371	04:24:14
#3	Add	Search **"General Practice"[Mesh]**	68490	04:23:59
#2	Add	Search **"Private Practice"[Mesh]**	11252	04:23:35

EMBASE 12.05.2016 (updated 21.08.2017)

Interface: OvidSP

Database: Embase 1974 to 2017

1	exp private practice/	13762
2	exp general practice/	74696
3	primary health care/	52053
4	general practitioner/	73375
5	general practi*.mp.	168448
6	Primary care physician*.mp.	20575
7	family physician*.mp.	15375
8	primary health care.mp.	61217
9	family practi*.mp.	11276
10	family medicine practi*.mp.	368
11	private practi*.mp.	20521
12	1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11	255926
13	exp echography/	607521
14	exp ultrasound/	129643
15	ultraso*.mp.	456732
16	sonograph*.mp.	63847
17	echograph*.mp.	341379
18	13 or 14 or 15 or 16 or 17	836843
19	12 and 18	4219

CINAHL 12.05.2016 (updated 21.08.2017)

Interface: Ebsco

EBSCOhost

Thursday, May 12, 2016 5:31:18 AM

#	Query	Limiters/Expanders	Last Run Via	Results
S1	(MH "Private Practice+")	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL with Full Text	3,959
S2	(MH "Family Practice")	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL with Full Text	11,738
S3	(MH "Primary Health Care")	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL with Full Text	32,878
S4	(MH "Physicians, Family")	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL with Full Text	8,972
S5	primary care physician*	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL with Full Text	4,191
S6	general practi*	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL with Full Text	11,908
S7	family physician*	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL with Full Text	2,808
S8	primary health care	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL with Full Text	35,036
S9	family practi*	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL with Full Text	12,998
S10	family medicine practi*	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL with Full Text	83
S11	private practi*	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL with Full Text	8,755
S12	S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10 OR S11	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL with Full Text	68,383
S13	(MH "Ultrasonography+")	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL with Full Text	34,226
S14	ultraso*	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL with Full Text	44,235
S15	sonograph*	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL with Full Text	3,436
S16	echograph*	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL with Full Text	141
S17	S13 OR S14 OR S15 OR S16	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL with Full Text	54,765
S18	S12 AND S17	Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL with Full Text	394

Web of Science 12.05.2016 (updated 21.08.2017)

Search History: Web of Science™ Core Collection

Set	Results	Save History / Create Alert / Open Saved History	Edit Sets	Combine Sets (AND / OR / Combine)	Delete Sets (Select All / Delete)
# 13	2,787	#12 AND #8 *Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years*	Edit	☐	☐
# 12	431,663	#11 OR #10 OR #9 *Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years*	Edit	☐	☐
# 11	5,317	TOPIC: (echograph*) *Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years*	Edit	☐	☐
# 10	55,241	TOPIC: (sonograph*) *Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years*	Edit	☐	☐
# 9	404,016	TOPIC: (ultraso*) *Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years*	Edit	☐	☐
# 8	329,817	#7 OR #6 OR #5 OR #4 OR #3 OR #2 OR #1 *Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years*	Edit	☐	☐
# 7	34,508	TOPIC: (primary care physician*) *Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years*	Edit	☐	☐
# 6	159,796	TOPIC: (general practi*) *Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years*	Edit	☐	☐
# 5	26,473	TOPIC: (family physician*) *Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years*	Edit	☐	☐
# 4	83,194	TOPIC: (primary health care) *Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years*	Edit	☐	☐
# 3	7,320	TOPIC: (family medicine practi*) *Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years*	Edit	☐	☐
# 2	69,651	TOPIC: (family practi*) *Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years*	Edit	☐	☐
# 1	27,235	TOPIC: (private practi*) *Indexes=SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI Timespan=All years*	Edit	☐	☐
				○ AND ○ OR Combine	Select All / ✕ Delete

Cochrane Central Register of Controlled Trials 12.05.2016 (updated 21.08.2017)

Date Run: 12/05/16 09:23:03.788

Description:

ID	Search	Hits
#1	MeSH descriptor: [Private Practice] explode all trees	137
#2	MeSH descriptor: [Primary Health Care] explode all trees	5823
#3	MeSH descriptor: [General Practitioners] explode all trees	144
#4	MeSH descriptor: [Physicians, Family] explode all trees	475
#5	MeSH descriptor: [Physicians, Primary Care] explode all trees	102
#6	primary care physician*:ti,ab,kw (Word variations have been searched)	4165
#7	general practi*:ti,ab,kw (Word variations have been searched)	10901
#8	family physician*:ti,ab,kw (Word variations have been searched)	2390
#9	"primary health care":ti,ab,kw (Word variations have been searched)	4526
#10	family practi*:ti,ab,kw (Word variations have been searched)	5516
#11	family medicine practi*:ti,ab,kw (Word variations have been searched)	675
#12	private practi*:ti,ab,kw (Word variations have been searched)	1150
#13	#1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10 or #11 or #12	22969
#14	MeSH descriptor: [Ultrasonography] explode all trees	8872
#15	ultraso*:ti,ab,kw (Word variations have been searched)	18428
#16	echograph*:ti,ab,kw (Word variations have been searched)	3190
#17	sonograph*:ti,ab,kw (Word variations have been searched)	1764
#18	#14 or #15 or #16 or #17	23749
#19	#13 and #18	253

Supplemental Appendix 2. Data extraction template

Point-of-care ultrasound in general practice: A systematic review

This appendix lists the data extraction template used in this review. The template is an adapted version of the Cochrane data extraction form (http://training.cochrane.org/resource/data-collection-forms-intervention-reviews) and the Downs and Blacks checklist[1] respectively.

PROSBERO registration ID: CRD42016038302

Data extraction according to Cochrane data collection form + Down and Blacks quality assessment tool

General information
Date extraction completed
Name of person extracting data
Report title
Year of publication
Report ID (Author name and number)
Published in
Publication type
Study funding source
Possible conflict of interest
Eligibility
Review inclusion criteria meet
Reporting use of US?
Reporting training in the use og US?

Type of study

Participants: (GPs)

Who was preforming the scan?

catagory

Intervention

Type of scanner described?

firm

portable?

Doppler?

Probe

Scanning procedure described?

Population and setting

Number of clinics

Number of GPs/GPs in training preforming us?

Withdrawals and exclusion (GPs)?

Population description (GPs)

Age?

Sex?

Experience?

Other relevant information?

Inclusion criteria (GPs)

Exclusion criteria (GPs)

Method/s of recruitment of participants (GPs)

Setting

Country

Location: City/rural

Location: Hospital/private clinic

Methods

data source

design

Aim of study

start date

end date

duration

Participants

Total no. Participants (patients)

Total invited patients

Total no. Participants (Scans)

Scans pr GP

Withdrawals and exclusion

Age

Sex

Other relevant sociodemographics

Inclusion criteria (patients)

Exclusion criteria (patients)

Method/s of recruitment of participants (patients)

Outcomes

The use of US

1. Is the extend of the examination decribed?

1.a Focused/Full examination

1.b Procedure described (probe placement)

1.c. Exact measurements described

2. Which organs are scanned?

3. On which indication do the GPs scan?

3.a Diagnostic purpose?

3.b Procedure related purpose?

3.c Screening purpose?

4. Frequency

4.a How often did the GP use POC-US? (everyday ?)

4.b In how many of the consultations were US used?

5. How much extra time was used on POC-US performed by GPs?

Training

6. Which type for training did the GP recieve?

6.a How many hours of training the GPs received prior to using POC-US?

6.b Which elements did the traning consist of?

6.c Was the training assesed?

6.d Who assesed the training?

6.e Was there a examination/certification at the end of training?

Quality assesment

7. How was the quality of the scans performed by a GP assessed?

8. Who assessed the quality of the GPs scans?

9. Was a gold standard used?

10. Description of the patient perspective on scans performed by GPs?

11. Description of the financial costs associated with POC-US performed by GPs?

12. What possible harms, following the use of POC-US in general practice, are described in the papers?

12.a Overlooked conditions?

12.b Incidental findings?

12.c Misdiagnosis?

12.d overdiagnosis and overtreatment?

12.e Estmate on diagnostic accurecy

12.f Technical difficulties

Applicability

Have important populations been excluded from the study?

Does the study directly address the review question?

Note

Other information

Key conclusions by author

Note

Risk of bias/quality assesment (Downs and Blacks)

Reporting

1. Is the hypothesis/aim/objective of the study clearly described?

2. Are the main outcomes to be measured clearly described in the Introduction or Methods section?

3. Are the characteristics of the patients included in the study clearly described ?

4. Are the interventions of interest clearly described?

5. Are the distributions of principal confounders in each group of subjects to be compared clearly described?

6. Are the main findings of the study clearly described?

7. Does the study provide estimates of the random variability in the data for the main outcomes?

8. Have all important adverse events that may be a consequence of the intervention been reported?

9. Have the characteristics of patients lost to follow-up been described?

10. Have actual probability values been reported(e.g. 0.035 rather than <0.05) for the main outcomes except where the probability value is less than 0.001?

External validity

11. Were the subjects asked to participate in the study representative of the entire population from which they were recruited?

12. Were those subjects who were prepared to participate representative of the entire population from which they were recruited?

13. Were the staff, places, and facilities where the patients were treated, representative of the treatment the majority of patients receive?

Internal validity - bias

14. Was an attempt made to blind study subjects to the intervention they have received ?

15. Was an attempt made to blind those measuring the main outcomes of the intervention?

16. If any of the results of the study were based on “data dredging”, was this made clear?

17. In trials and cohort studies, do the analyses adjust for different lengths of follow-up of patients, or in case-control studies, is the time period between the intervention and outcome the same for cases and controls ?

18. Were the statistical tests used to assess the main outcomes appropriate?

20. Were the main outcome measures used accurate (valid and reliable)?

Internal validity - confounding (selection bias)

25. Was there adequate adjustment for confounding in the analyses from which the main findings were drawn?

26. Were losses of patients to follow-up taken into account?

Total score

Supplemental Appendix 3. Study characteristics

Point-of-care ultrasound in general practice: A systematic review

This appendix lists the characteristics of the included articles.

Web table 3.1 Characteristics of the included articles

Study		Study characteristics			Participants characteristics						
Author	ref.no.	Year	Design	Downs and Black score	Country	Location	Type of clinic	Participant	Number of clinics	Number of participants (GP/GPT)	Number of patients
Bailey	**15**	2001	Prospective cohort	10	USA	ND	Hospital	GPT	1	16	74
Barabas	**16**	2005	Cross-sectional	16	Sweden	ND	Municipal nursing homes	GP	3	1	147
Blois	**17**	2012	Cross-sectional	13	Canada	Rural	Primary care clinic	GPT	1	1	47
Bornemann	**18**	2014	Prospective cohort	5	USA	ND	Tripler army center	GPT, faculty	1	15 (7)	ND
Bornemann	**19**	2015	Prospective cohort	18	USA	ND	Tripler army center	GP, GPT	1	4	101
Bornemann	**20**	2017	Prospective cohort	13	USA	ND	Hospital	GPT	ND	17	ND
Bratland (obstetric)	**21**	1985	Prospective cohort	16	Norway	Rural	Primary care clinic	GP	1	1	44
Bratland (evaluation)	**22**	1985	Prospective cohort	6	Norway	Rural	Primary care clinic	GP	1	1	378
Bratland (gallbladder)	**23**	1985	Prospective cohort	13	Norway	Rural	Primary care clinic	GP	1	1	55
Bratland (urinary tract)	**24**	1985	Prospective cohort	13	Norway	Rural	Primary care clinic	GP	1	1	56
Bratland (heart)	**25**	1985	Prospective cohort	11	Norway	Rural	Primary care clinic	GP	1	1	51
Busse	**26**	1999	Cross-sectional	14	Germany	ND	Primary care clinic	GP, internists	ND	86 (57)	1.217
Chan	**27**	1999	Retrospective cohort	10	Australia	Suburban	Primary care clinic	GP	1	1	273
Chavez	**28**	2015	Cross-sectional	18	Nepal, Peru	Rural	Hospital	GP	ND	2	378
Chebli	**29**	2017	Cross-sectional	12	Morocco	Rural	School	GP	ND	24	5367

Colli	**30**	2015	Prospective cohort	11	Italy	Both city and rural	Hospitals, GP office	GP, hospital doctors	Four medical wards, 1 outpatient clinic and 90 general practices	135 (90)	2014
Del Carpio	**31**	2012	Prospective cohort	10	Argentina	Rural	Schools	GP, GPT	ND	180	ND (22.793 scans)
Deutchman	**32**	1994	Cross-sectional	15	USA	Both city and rural	Primary care clinic	GP	3	ND	221
Dingwall	**33**	1979	Cross-sectional	8	Scotland	Both city and rural	Primary care clinic	GP	3	3	ND (45 scans)
Eggebø	**34**	1989	Prospective cohort	11	Norway	Rural	Primary care clinic	GP	1	1	102
Eggebø	**35**	1990	Prospective cohort	10	Norway	Rural	Primary care clinic	GP	1	1	189
Ellington	**36**	2017	Cross-sectional	20	Peru	City	Hospital	GP	1	3	1062
Evangelista	**37**	2016	Prospective cohort	17	Spain	Rural	Primary care clinic	GP	3	14	1312
Everett	**38**	1996	Prospective cohort	10	UK	City	Health center ultrasound clinic	Senior Midwife and GP	1	1	240
Filipas	**39**	2003	Prospective cohort	8	Germany	City	Primary care clinic	GPs, general internists, urologists	ND	153 (55)	9959
Gillespie	**40**	1998	Cross-sectional	7	England	City	Primary care clinic	Technisian and GPs	1	3 (2)	ND
Glasoe	**41**	2007	Prospective cohort	10	Norway	ND	Primary care clinic	GP	1	3	174
Greenlund	**42**	2017	Cross-sectional	8	USA	ND	Outpatient primary care procedure clinic	GP	1	7	31
Hahn	**43**	1988	Prospective cohort	8	USA	City	Primary care clinic	GP	1	3	ND
Hahn	**44**	1988	Prospective cohort	12	USA	ND	Primary care clinic	GP	4	13	ND
Hussain	**46**	1999	Prospective cohort	7	UK	ND	Primary care clinic	GP	2	ND	64
Hussain	**45**	2004	Cross-sectional	11	UK	ND	Primary care clinic	GP	1	1	50
Johansen	**47**	2002	Retrospective cohort	12	Norway	Rural	Primary care clinic	GP	1	1	ND
Keith	**48**	2001	Retrospective cohort	13	USA	ND	Primary care clinic	GPT	1	ND	91
Lindgaard	**49**	2017	Cross-sectional	13	Denmark	ND	Primary care clinic	GP	5	5	104
Mjølstad	**50**	2012	Prospective cohort	17	Norway		Primary care clinic	GP	3	7	92
Morgan	**51**	1988	Case-series	5	USA		Hospital - based family clinic	GP	1	ND	3
Okahara	**52**	2016	Retrospective cohort	10	Japan	ND	Primary care clinic	GP	>=11	ND	135

Ornstein	**53**	1990	Prospective cohort	15	USA		university	GP	2	4	498
Rodney	**54**	1990	Prospective cohort	16	USA		Community	GP	1	2	207
Rosenthal	**55**	1993	Prospective cohort	9	USA		Primary care clinic	GP	1	1	189
Siepel	**56**	2000	Prospective cohort	9	USA		Primary care clinic	GP	1	1	72
Siso-almirall	**57**	2017	Prospective cohort	15	Spain	City	Primary care clinic	GP	3	4	1024
Smith	**58**	1991	Prospective cohort	15	USA		Primary care clinic	GPT	1	12	ND
Strasser	**59**	1987	Retrospective cohort	16	canada		Primary care clinic	GPT	2	ND	43
Szwamel	**60**	2017	Retrospective cohort	6	Poland	Mixed	Primary care clinic	GP, GPT, specialties in other branches of medical practice	ND	81	ND
Todsen	**61**	2016	RCT	17	Denmark		university teaching center	GP, GPT, ENT doctor	1	31(26)	4
Weerasinghe	**62**	2006	Prospective cohort	11	UAE		Primary care clinic	GP	1	3	300
Wong	**63**	2013	Prospective cohort	10	USA	ND	university teaching clinic	GP	1	8	4
Wordsworth	**64**	2002	Prospective cohort	15	Scotland	Rural	Primary care clinic	GP	1	2	131 (500 questionnaire)
Zamorano	**65**	2002	Cross-sectional	10	Spain	ND	hospital	GP	1	1	200

Supplemental Appendix 4. Clinical application

Point-of-care ultrasound in general practice: A systematic review

This web appendix provides a detailed description of the clinical application of ultrasound and the type of examination performed in the included articles. References to the included articles are provided both in the text and in web table 4.1.

Abdominal ultrasound examinations

An explorative examination of abdominal symptoms was reported in five articles[28,29,47,62,66]. In 11 studies ultrasound was used to screen for abdominal pathology specifically for kidney tumours[41], gallstones in pregnant women[34], aortic aneurisms[17,19,57,59,62], cystic echinococcosis[31,33] and two articles[56,57] described an extensive abdominal screening of asymptomatic patients for pathology relating to the aorta, gallstones, urinary retention, calcified gallbladder, ascites, liver, and kidneys. The remaining articles described a focused approach when examining the following organs: Liver[37,57,65], gallbladder[20,25,32,34,37,51, 57,63,65], kidney[32,37,57,63,65], urinary tract[18,26,43,57], aorta[20,22,32,37,51,56,63,65], spleen[32], pancreas[37] and five studies examined for ascites[20,32,51,57,63]. One study[43] declared a focused approach but did not describe which organs were examined.

Time consumption was described for focused examinations to be from <2 minutes to <10 minutes[34,51,63] and 12 minutes for full descriptive examinations of the urinary tract[26]. Examinations of the aorta was performed in 3 to 6 minutes[19,51,59,63].

Obstetric and pelvic ultrasound examinations

Obstetric application was described in 21 articles. Six articles[23,36,49,55,56,60] described a full detailed obstetric examination and eight articles a focused obstetric examination[20,34,40,43,45,46,51,64] including estimation of gestational age[20, 36,45-47, 49-51, 55,56,60,62], locating the foetus[20,45-47,49,51,55,56], detection of foetal heart movement[20,36,40,45-47,49,51,55,56,60], diagnosing foetal malformations[23,46,49,55,56,60], and location of the placenta[20,36,46,49,55,60].

Pelvic examinations were also described in non-pregnant women for diagnostic purposes six articles[24,29,43,47,62,66] and screening for uterine enlargement in two articles[57,58]. Focused examinations were described in four articles[24,43,57,58], while a full detailed examination was only described in one article[62]. The remaining articles did not provide details on the performed examinations.

Time consumption was described with a mean below 6 minutes [range 2-15 minutes] for focused examination[51] and an average under 11 minutes for full examinations[23].

Ultrasound examinations of the heart.

The approach for assessing heart function differed widely. Only three articles described a full echocardiography[27,42,67], whereas eight other articles[20-22,32,39,52,58,65] described various degrees of focused examinations including obtaining an apical 4-chamber-view and measured the septal mitral annular excursion[52], estimation of left ventricle function at the parastenal long-axis view of the heart[21,22], obtaining parasternal long- and short axis view together with a four-chamber view and subcostal visualisation of inferior vena cava[39] or simply describing presence or absence of pericardial effusion[32]. The remaining articles[20,58,65] did not specify how the focused ultrasound examination of the heart was performed. In two of the articles, ultrasound examinations of the heart were performed as screening tests for heart disease[39,58].

Time consumptions was described to be <5 minutes for focused examinations[52] and 18 minutes for more extensive examination[27].

Ultrasound examinations of the lungs.

Two articles described US used for diagnosing pneumonia in children[30,38], where children aged two months to three years where examined in the supine position in six locations according to an international established guideline. Two other papers reported the search for or finding of pleural effusion in adults[22,32].
Time consumptions was described with a mean of 6.4 minutes[30] and <10 minutes[38].

Other areas of use

Two articles reported screening for carotid atherosclerosis[54,58], whereas eight articles described use of ultrasound in various other areas without providing details of the examination, but including the musculoskeletal system[20,24,29,43,62], neck[29], breasts[29], male pelvis including prostate and scrotum[29,43,62], venous thrombosis[22] , assessing peripheral circulation[35,] the thyroid gland[43,58,62], lymph nodes[43], and skin tumors[43].
Procedure related ultrasound was used when draining skin abscesses[44], for breast cyst aspiration (cytology)[29], and vascular assess[43].

Time used for the examinations were described to be 5-10 minutes for focused examinations[43] and 15 minutes for detailed screening examinations of the thyroid gland or carotides[58.]

Web table 4.1 Clinical applications of ultrasound

Anatomical area	Diagnostic purpose	Screening purpose	Procedure related	Focused examination	Full detailed examination	No details

Musculoskeletal	20,24,29,43,62			20,43	62	24,29
Heart	20,21,22,27,32,39,42,52,65,67	39,58		20,21,22,32,39,52,58,65	27,42,67	
Lung	22,30,32,38			22,30,32,38		
Abdomen (unspecified)	28,29,43,62,66	29,58		43,58	62	28,29,66
FAST	20,32,51,57,63	57		20,32,51,57,63		
Aorta	20,22,32,37,51,57,62,63,65	17,19,57,59,62		17,19,20,22,32,37,51,57,59,63,65	62	
Liver	37,47,57,62,65	29,57		37,57,65	62	29,47
Gall bladder	20,25,29,32,37,47,51,57,62,63,65	34,57		20,25,32,34,37,51,57,63,65	62	29,47
Pancreas	37,47,62			37	62	47
Spleen	32,47,62			32	62	47
Urinary tract	18,26,29,43,48,57,62	57		18,26,43,48,57	62	29
Kidney	29,32,37,47,57,62,63,65	41,57		32,37,57,63,65	41,62	29,47
Cystic Echinococcosis	33	31,33		31,33		
Male pelvis	29,43,62			43	62	29
Female pelvis	24,29,43,47,62,66	57,58		24,43,57,58	62	29,47,66
Obstetrics	20,23,29,34,35,36,40,43,45,46,47,49,50,51,53,55,56,60,61,64,66	23,35,36,49,60		20,34,40,43,45,46,51,64	23,36,49,55,56,60	29,35,47,50,53,61,66
Neck	29					29
Breast	29		29			29
Thyroid	43,62	58		43,58	62	
Soft tissue	24			24		

Skin tumors	43,44		44	43,44		
Lymph nodes	43			43		
Carotid		54,58		54,58		
Venous thrombosis	22			22		
Peripheral circulation	35	35		35		
Access to blood vessel			43	43		

FAST= (Focused assessment with sonography in trauma). US scan for detection of intraperitoneal fluid

Supplemental Appendix 5. Quality assessment

Point-of-care ultrasound in general practice: A systematic review

This web appendix provides to tables. The first table (Web table 5.1) lists the used quality measurements in the included articles. The second tables (Web table 5.2) list the described quality in the included articles.

Web table 5.1 Quality measurement

Quality Measure	N*	Reference.
Compared to a specialist's scan	**11**	17,19,20,39,50,51,52,59,60,64,67
Compared to birth outcome**	**6**	36,40,49,55,56,61
Journal audit	**10**	32,33,36,37,40,49,57,58,61,66
Interobserver agreement	**3**	30,38,39
Uploaded scan for review/ review of video or still pictures	**14**	22,23,25,26,27,38,39,42,45,46,47,48,51,66
Supervised scan	**7**	17,22,48,60,63,64,65
Repeated scan of positive findings by specialist	**4**	33,37,41,59
Compared to CT	**4**	38,41,54,59
Examination after training programme	**12**	17,20,22,33,45,46,51,55,58,59,63,65
Not decleared	**13**	18,20,24,28,29,31,34,35,42,43,44,53,62

N = number of studies*

Web table 5.2: Quality assessment

Organ	Comparison	Sensitivity	Specificity	Interrater variability	Percent of ultrasound exams deemed acceptable	Confirmed diagnosis	Hours of training	Year of publication	Downs and Black score	Ref.
Aorta	Specialist scan	100%	100%	-		100%	2.3	2001	10	17
Aorta	Specialist scan	100%	100%	-	-	-	ND	2012	13	19
Aorta	Positive findings re-scanned	-	-	-	-	11/14 (79%)	25	2017	15	59
Heart	Specialist scan	73%	75%	-	-	-	4	2015	18	21
Heart	Review	-	-	-	40%	29/44 (66%)	320	1985	11	27
Heart	Review			Kappa 0.52	80.8%	84.2%	28	2016	17	39
Heart	Specialist scan	77.4%	85.4%	-	-	-	8	2012	17	52
Heart	Specialist scan	-	-	-	-	192/200 (96%)	ND	2002	10	67
Lung	Interobserver agreement between two GPs	-	-	Kappa 0.79	-	-	14	2015	18	30
Lung	Radiographically-confirmed	92.2%	95.2%	Kappa 0.65	-	-	7 day	2017	20	38

	clinical pneumonia									
Abdomen	Positive findings re-scanned	-	-	-	-	26/27 (96%)	ND	1990	10	37
aorta, gallbladder, kidney, abdomen	Known pathology	-	-	-	-	65 %	4	2016	17	63
Kidney	Positive findings rescanned	82%	99%	-	-	-	ND	2003	8	41
Urinary tract	review	-	-	-	90%	-	ND	2004	11	48
A.carotis	CT	-	-	-	-	79%	ND	2016	10	54
Obstetric	Birth outcome	97.3%	97.7%	-	-	-	ND	1996	10	40
Obstetric	Review	-	-	-	97%	-	52+	1988	8	45
Obstetric	Review	-	-	-	94%	-	52+	1988	12	46
Obstetric	Birth outcome	-	-	GA as accurate as specialist	-	100% (twins)	278	2002	12	49
Obstetric	Specialist scan	-	-	-	-	Mean difference in GA 1,5 days	ND	2001	13	50
Obstetric	Birth outcome	-	-	-	-	GA mean difference 1.1 day, multiple gestation PPV and NPV 100%,	52+	1990	15	55

						fetal death PPV 85% NPV 98%, 11% false positive placenta praevia, 1 major abnormality missed				
Obstetric	Birth outcome	-	-	-	-	GA 92% and 96 % No diagnoses missed	24	1990	16	56
Obstetric	Specialist scan	-	-	resident-faculty % difference: 3.6% for AC, 1.6% for HC, 1.9% for BPD	-	-	ND	1991	15	60
Broad use: * (Abdomen, lung, heart, bladder, spleen, aorta)	Specialist scan	91%	83%	-	-	-	43	2015	11	32
Broad use:	Review	-	-	-	85	9/9 (100%)	ND	1999	7	47
Broad use:	Journal audit/re-examination of positive	-	-	Internal reliability 96%, external	-	23/28 (82%)	ND	1993	9	57

	findings by specialist			reliability 82%						
Broad use:	Journal audit	-	-	-	-	64/72 (89%)	ND	2000	9	58
Broad use:	Specialist scan	98% 100% GA	95%	Kappa 0.93	-	-	ND	2017	13	51

GA= gestational age, PPV= positive predictive value, NPV = negative predictive value, AC = abdominal circumference, HC = head circumference, BPD = biparietal diameter

** only 37% of US scan was performed by GP*