Electronic supplementary material, ESM 2

RISK OF BIAS ASSESSMENT

Judgement:
YES: low risk of bias
UNCLEAR: unclear risk of bias
NO: risk of bias

Sample of patients

1. Inclusion criteria defined
    - Inclusion criteria clearly defined
    - Shock defined (see nr 2)
    - YES: Inclusion criteria and shock defined
    - UNCLEAR: Definition of shock or other diagnostic criteria not reported
    - NO: Inclusion criteria not reported
2. Adequate description of diagnostic criteria: Shock defined
    - Definition of shock
    - YES: Shock clearly defined
    - UNCLEAR: Definition ambiguous
    - NO: Not reported
3. Sample selection explained
    - Recruitment procedure
    - YES: Recruitment procedure explained, for instance “all consecutive patients with septic shock”
    - UNCLEAR: Recruitment procedure ambiguous, for instance “XX patients with septic shock were included” -> risk for selection
    - NO: Not reported
4. Sample complete
    - Sample size calculation
    - Nr of patients
    - YES: Sample size calculation done and reached
    - UNCLEAR: Sample size calculation not reported or done
    - NO: sample size calculated but not reached
5. Clinical and demographic characteristics adequately described
    - Age
    - Vasopressor use
    - Blood pressure
    - YES: All the above factors reported
    - UNCLEAR: One of the above factors not reported
    - NO: More than one of the above factors not reported
6. Sample representative
    - Inclusion criteria defined (see nr 1)
    - Shock defined (see nr 2)
    - Sample selection explained (see nr 3)

- YES: All of the above judged YES
- UNCLEAR: One or more of the above judged UNCLEAR or NO
- NO: Not applicable, since not representative populations were not included in the review

7. NARRATIVE: Sample assembled at a common point of the course of the disease
    - Narrative assessment

<u>Follow-up of patients</u>

8. Follow-up defined
    - Follow up
    - YES: Defined
    - UNCLEAR: Ambiguous
    - NO: Not reported
9. NARRATIVE: Follow-up sufficiently long
    - Narrative assessment
10. Outcomes clearly (pre-)defined
    - Protocol available online or published
    - Endpoints defined
    - YES: Endpoints defined and protocol available
    - UNCLEAR: Protocol not available
11. Outcomes objective OR…
    - Reported outcomes
    - Outcomes should either be objective, or assessment blinded
    - YES: Outcomes objective, such as mortality, SOFA score etc.
    - UNCLEAR: Outcomes somewhat subjective, such as videomicroscopic data, neurological status
    - NO: Subjective outcomes
12. ...Outcomes unbiased (e.g. Blinded)
    - Blinding
    - YES: Blinded assessment reported
    - UNCLEAR: Blinding not reported
    - NO: Assessment not blinded
13. Outcome data complete
    - Missing data
    - YES: No missing data
    - UNCLEAR: < 20% missing data
    - NO: 20% or more missing data
14. NARRATIVE Outcomes appropriate
    - Narrative assessment

<u>Prognostic variable</u>

15. NIRS data complete
    - Missing data
    - YES: No missing data
    - UNCLEAR: < 20% missing data
    - NO: 20% or more missing data

16. NIRS monitoring adequately described
    - Measurement site
    - Make and model of device
    - Type of NIRS probe
    - Timing and duration of measurements
    - VOT procedure if VOT performed
        - *All of the above factors are known to affect NIRS measurements*
    - YES: All described
    - UNCLEAR: One factor not reported
    - NO: More than one factor not reported
17. NIRS variable cutpoints pre-defined and justified
    - Defining cutpoints
        - *Risk of overoptimistic results with data derived cutpoints*
    - YES: cutpoints pre-defined, based on some other data, or median etc…
    - UNCLEAR: Not reported, how cutpoints were chosen
    - NO: Data derived cutpoints used

<u>Analysis</u>

18. Statistical adjustment for important prognostic factors
    - Statistical adjustment
    - YES: Statistical adjustment reported
    - UNCLEAR: Not reported
    - NO: Not done

ELECTRONIC SEARCH STRATEGY:

ORIGINAL SEARCH:

PubMed
13.12.2016
Total: 98 records (RCT: 1; Obsevational Study 6; other 91)
((NIRS[All Fields] OR ("spectroscopy, near-infrared"[MeSH Terms] OR ("spectroscopy"[All Fields] AND "near-infrared"[All Fields]) OR "near-infrared spectroscopy"[All Fields] OR ("near"[All Fields] AND "infrared"[All Fields] AND "spectroscopy"[All Fields]) OR "near infrared spectroscopy"[All Fields])) AND ((("critical illness"[MeSH Terms] OR ("critical"[All Fields] AND "illness"[All Fields]) OR "critical illness"[All Fields] OR ("critically"[All Fields] AND "ill"[All Fields]) OR "critically ill"[All Fields]) OR ("critical care"[MeSH Terms] OR ("critical"[All Fields] AND "care"[All Fields]) OR "critical care"[All Fields])) OR ("critical care"[MeSH Terms] OR ("critical"[All Fields] AND "care"[All Fields]) OR "critical care"[All Fields] OR ("intensive"[All Fields] AND "care"[All Fields]) OR "intensive care"[All Fields]))) AND (("shock"[MeSH Terms] OR "shock"[All Fields]) OR ("shock"[MeSH Terms] OR "shock"[All Fields] OR ("circulatory"[All Fields] AND "failure"[All Fields]) OR "circulatory failure"[All Fields]))

Translations:	
near infrared spectroscopy	"spectroscopy, near-infrared"[MeSH Terms] OR ("spectroscopy"[All Fields] AND "near-infrared"[All Fields]) OR "near-infrared spectroscopy"[All Fields] OR ("near"[All Fields] AND "infrared"[All Fields] AND "spectroscopy"[All Fields]) OR "near infrared spectroscopy"[All Fields]
critically ill	"critical illness"[MeSH Terms] OR ("critical"[All Fields] AND "illness"[All Fields]) OR "critical illness"[All Fields] OR ("critically"[All Fields] AND "ill"[All Fields]) OR "critically ill"[All Fields]
critical care	"critical care"[MeSH Terms] OR ("critical"[All Fields] AND "care"[All Fields]) OR "critical care"[All Fields]
intensive care	"critical care"[MeSH Terms] OR ("critical"[All Fields] AND "care"[All Fields]) OR "critical care"[All Fields] OR ("intensive"[All Fields] AND "care"[All Fields]) OR "intensive care"[All Fields]
shock	"shock"[MeSH Terms] OR "shock"[All Fields]
circulatory failure	"shock"[MeSH Terms] OR "shock"[All Fields] OR ("circulatory"[All Fields] AND "failure"[All Fields]) OR "circulatory failure"[All Fields]

OVID Medline
9.1.2017
Total: 134 records (RCT: 1; Obsevational Study 11; other 122)
Database: Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Ovid MEDLINE(R) Daily and Ovid MEDLINE(R) <1946 to Present>
Search Strategy:

1 exp Shock/ (73887)
2 exp Acute Kidney Injury/ (42688)
3 exp Respiration, Artificial/ (72764)
4 shock*.mp. (227901)
5 (Organ* adj2 Failure*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier] (24600)
6 (organ* adj2 dysfunction*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier] (12248)
7 (System* adj2 Inflamm* adj2 Respons* adj2 Syndrome*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier] (7754)
8 (Acute* adj2 Kidney* adj2 Injur*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier] (47207)
9 (Acute* adj2 Tubular* adj2 Necrosis*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier] (4856)
10 (respirat* adj2 Artificial*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier] (47312)
11 (High* adj4 Ventilat*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier] (9055)
12 (Ventilator* adj2 Support*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier] (6516)
13 (Liquid* adj2 Ventilat*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier] (757)
14 (Noninvasiv* adj2 Ventilat*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier] (3335)
15 (One* adj3 Ventilat*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier] (2663)
16 (Positiv* adj3 Respirat*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier] (18883)
17 (Contin* adj2 Positiv* adj2 Airway* adj2 Pressur*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier] (10912)
18 (Intermittent* adj2 Positive-Pressure adj2 Breath*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier] (1093)
19 (Intermittent* adj2 Positiv* adj4 Breath*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier] (1107)
20 (Intermittent* adj2 Positiv* adj4 Ventil*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier] (3135)

21 (Ventilat* adj2 Wean*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier] (4172)
22 exp Critical Illness/ (23886)
23 exp Intensive Care Units/ (72968)
24 Critical Care/ (48392)
25 exp Sepsis-Associated Encephalopathy/ or exp Sepsis/ (117111)
26 (critical* adj2 ill*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier] (51176)
27 (intensive adj2 care).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier] (150423)
28 (critical* adj2 care).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier] (64299)
29 sepsis.mp. (114740)
30 (septi* adj2 shock*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier] (32166)
31 circulatory failure.mp. (2045)
32 (circulator* adj4 failur*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier] (2588)
33 1 or 4 or 25 or 29 or 30 or 31 or 32 (375053)
34 near infrared spectroscopy.mp. or exp Spectroscopy, Near-Infrared/ (15148)
35 (nir adj3 spectroscop*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier] (2491)
36 (nir adj3 spectrometr*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier] (92)
37 (near-infrared adj3 spectroscop*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier] (15913)
38 (near-infrared adj3 spectrometr*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier] (180)
39 NIRS.mp. (4996)
40 34 or 35 or 36 or 37 or 38 or 39 (17525)
41 2 or 3 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 (172230)
42 22 or 23 or 24 or 26 or 27 or 28 (215680)
43 41 or 42 (353529)
44 33 and 40 and 43 (134)
45 limit 44 to randomized controlled trial (1)
46 limit 44 to observational study (11)
47 45 or 46 (12)
48 44 not 47 (122)

EBM Reviews
30.12.2016

Total: 12 records

Database: EBM Reviews - Cochrane Database of Systematic Reviews <2005 to December 21, 2016>, EBM Reviews - ACP Journal Club <1991 to December 2016>, EBM Reviews - Database of Abstracts of Reviews of Effects <1st Quarter 2015>, EBM Reviews
- Cochrane Central Register of Controlled Trials <November 2016>, EBM Reviews - Cochrane Methodology Register <3rd Quarter 2012>, EBM Reviews - Health Technology Assessment <4th Quarter 2016>, EBM Reviews - NHS Economic Evaluation Database <1st Quarter 2015> Search Strategy:

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1 exp Shock/ (1413)
2 exp Acute Kidney Injury/ (759)
3 exp Respiration, Artificial/ (4959)
4 shock*.mp. (6604)
5 (Organ* adj2 Failure*).mp. [mp=ti, ab, tx, kw, ct, ot, sh, hw] (1825)
6 (organ* adj2 dysfunction*).mp. [mp=ti, ab, tx, kw, ct, ot, sh, hw] (1050)
7 (System* adj2 Inflamm* adj2 Respons* adj2 Syndrome*).mp. [mp=ti, ab, tx, kw, ct, ot, sh, hw] (704)
8 (Acute* adj2 Kidney* adj2 Injur*).mp. [mp=ti, ab, tx, kw, ct, ot, sh, hw] (1489)
9 (Acute* adj2 Tubular* adj2 Necrosis*).mp. [mp=ti, ab, tx, kw, ct, ot, sh, hw] (122)
10 (respirat* adj2 Artificial*).mp. [mp=ti, ab, tx, kw, ct, ot, sh, hw] (3235)
11 (High* adj4 Ventilat*).mp. [mp=ti, ab, tx, kw, ct, ot, sh, hw] (1312)
12 (Ventilator* adj2 Support*).mp. [mp=ti, ab, tx, kw, ct, ot, sh, hw] (901)
13 (Liquid* adj2 Ventilat*).mp. [mp=ti, ab, tx, kw, ct, ot, sh, hw] (28)
14 (Noninvasiv* adj2 Ventilat*).mp. [mp=ti, ab, tx, kw, ct, ot, sh, hw] (672)
15 (One* adj3 Ventilat*).mp. [mp=ti, ab, tx, kw, ct, ot, sh, hw] (653)
16 (Positiv* adj3 Respirat*).mp. [mp=ti, ab, tx, kw, ct, ot, sh, hw] (1699)
17 (Contin* adj2 Positiv* adj2 Airway* adj2 Pressur*).mp. [mp=ti, ab, tx, kw, ct, ot, sh, hw] (2398)
18 (Intermittent* adj2 Positive-Pressure adj2 Breath*).mp. [mp=ti, ab, tx, kw, ct, ot, sh, hw] (136)
19 (Intermittent* adj2 Positiv* adj4 Breath*).mp. [mp=ti, ab, tx, kw, ct, ot, sh, hw] (141)
20 (Intermittent* adj2 Positiv* adj4 Ventil*).mp. [mp=ti, ab, tx, kw, ct, ot, sh, hw] (470)
21 (Ventilat* adj2 Wean*).mp. [mp=ti, ab, tx, kw, ct, ot, sh, hw] (867)
22 exp Critical Illness/ (1220)
23 exp Intensive Care Units/ (2909)
24 Critical Care/ (1582)
25 exp Sepsis-Associated Encephalopathy/ or exp Sepsis/ (3151)
26 (critical* adj2 ill*).mp. [mp=ti, ab, tx, kw, ct, ot, sh, hw] (4575)
27 (intensive adj2 care).mp. [mp=ti, ab, tx, kw, ct, ot, sh, hw] (14882)
28 (critical* adj2 care).mp. [mp=ti, ab, tx, kw, ct, ot, sh, hw] (3299)
29 sepsis.mp. (6966)
30 (septi* adj2 shock*).mp. [mp=ti, ab, tx, kw, ct, ot, sh, hw] (1539)
31 circulatory failure.mp. (58)
32 (circulator* adj4 failur*).mp. [mp=ti, ab, tx, kw, ct, ot, sh, hw] (84)
33 1 or 4 or 25 or 29 or 30 or 31 or 32 (14205)
34 near infrared spectroscopy.mp. or exp Spectroscopy, Near-Infrared/ (573)
35 (nir adj3 spectroscop*).mp. [mp=ti, ab, tx, kw, ct, ot, sh, hw] (18)
36 (nir adj3 spectrometr*).mp. [mp=ti, ab, tx, kw, ct, ot, sh, hw] (0)
37 (near-infrared adj3 spectroscop*).mp. [mp=ti, ab, tx, kw, ct, ot, sh, hw] (584)
38 (near-infrared adj3 spectrometr*).mp. [mp=ti, ab, tx, kw, ct, ot, sh, hw] (8)
39 NIRS.mp. (236)
40 34 or 35 or 36 or 37 or 38 or 39 (610)
41 2 or 3 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 (13172)
42 22 or 23 or 24 or 26 or 27 or 28 (18114)
43 41 or 42 (27051)

44 33 and 40 and 43 (12)

SCOPUS:
30.12.2016
Total: 48 vrecords (RCT: 2; Observational Study 8; other 38)
Possible duplicates: AND NOT DBCOLL (MEDL): 142 kpl

(**TITLE-ABS-KEY**((shock* OR sepsis OR (septi* W/2 shock*) OR "circulatory failure" OR (circulator* W/4 failur*)) **AND** ("near infrared spectroscopy" OR NIRS OR (nir W/3 spectroscop*) OR (nir W/3 spectrometr*) OR (near-infrared W/3 spectroscop*) OR (near-infrared W/3 spectrometr*)) **AND** (((high* W/4 ventilat*) OR (ventilator* W/2 support*) OR (liquid* W/2 ventilat*) OR (noninvasiv* W/2 ventilat*) OR (one* W/3 ventilat*) OR (positiv* W/3 respirat*) OR (contin* W/2 positiv* W/2 airway* W/2 pressur*) OR (intermittent* W/2 positive-pressure W/2 breath*) OR (intermittent* W/2 positiv* W/4 breath*) OR (intermittent* W/2 positiv* W/4 ventil*) OR (ventilat* W/2 wean*)) OR ((critical* W/2 ill*) OR (intensive W/2 care) OR (critical* W/2 care))))) OR (**TITLE-ABS-KEY**((shock* OR sepsis OR (septi* W/2 shock*) OR "circulatory failure" OR (circulator* W/4 failur*)) **AND** ("near infrared spectroscopy" OR NIRS OR (nir W/3 spectroscop*) OR (nir W/3 spectrometr*) OR (near-infrared W/3 spectroscop*) OR (near-infrared W/3 spectrometr*)) **AND** (((organ* W/2 failure*) OR (organ* W/2 dysfunction*) OR (system* W/2 inflamm* W/2 respons* W/2 syndrome*) OR (acute* W/2 kidney* W/2 injur*) OR (acute* W/2 tubular* W/2 necrosis*) OR (respirat* W/2 artificial*)) OR ((critical* W/2 ill*) OR (intensive W/2 care) OR (critical* W/2 care))))) **AND NOT DBCOLL (MEDL)**
RCT:
(TITLE-ABS-KEY (rct) OR TITLE-ABS-KEY (random* W/2 control* W/2 trial*))
Observational study:
TITLE-ABS-KEY observat* W/2 stud*

SEARCH UPDATED:

EBM Reviews
8.11.2018
Total: 5 new records

MEDLINE
6.11.2018
Total: 17 new records

PubMed
9.11.2018
Total: 17 new records

Scopus
12.11.2018
Total 7 new records

MANUAL SEARCHES

NIRS MONITOR MANUFACTURERS WEBPAGES:

- INVOS
  - http://www.medtronic.com/covidien/products/cerebral-somatic-oximetry
  - No potential references found, search date 27.01.2017 and 11.12.2018
- ISS
  - http://www.iss.com/biomedical/instruments/oxiplexTS.html
  - One potential reference found [3], appeared to be a duplicate, search date 27.01.2017 and 11.12.2018
- InSpectra
  - Hutchinson Technology Inc. (BioMeasurement Division, Hutchinson, MN, USA)
  - http://www.htch.com/BioMeasurement.asp
  - ''Hutchinson Technology is in the process of being acquired by another company. At this time, we are not selling or providing quotes for our BioMeasurement products.''
  - No potential references, search date 27.01.2017
  - 11.12.2018 no mention of NIRS oximeter on their webpages https://www.htch.com/WebHTI/Home
- (Prototype, Biospectrometer-NB Oximeter
  - Hutchinson Technology, Inc, Hutchinson, Minn)
- NIRO
  - https://www.hamamatsu.com/jp/en/C10448.html
  - No potential references, search date 27.01.2017 and 11.12.2018
- The FORE-SIGHT Cerebral Oximeter
  - CASMED, Branford, Conn
  - http://www.fore-sight.com/
  - No potential references 28.02.2018, 11.12.2018.
- CRAINscan
  - Optical Diagnostic Systems, Pittsburgh, Pa? Ei löytynyt sivustoa
  - https://www.bytecmed.com/en/referenzen/crainscan
  - Bytec Medizintechnik GmbH Hermann-Hollerith-Str. 11
    D-52249 Eschweiler
  - No references 28.2.2018
  - 11.12.2018 https://www.bytecmed.com/en/referenzen/crainscan no page found.
- PortaLite
  - Artinis, Medical System, Zetten, the Netherlands
  - http://www.artinis.com/portalite/
  - Research purposes only
  - Long list of studies in athletes and one thesis about NIRS in general but no potential references 28.2.2013, 11.12.2018
- NIMO-4 continuous-wave quantitative photometer
  - Nirox srl, Brescia, Italy,
  - Can't find a website 28.02.2018, 11.12.2018
- MoorVMS-OXY
  - Moor Instruments Inc, Wilmington, DE

    - https://us.moor.co.uk/product/moorvms-oxy-superficial-tissue-oxygenation-monitor/202
    - No potential references 28.2.2018, 11.12.2018
- Critikon 2020
    - Johnson & Johnson, UK → myyty? GE:lle?
    - No mention of NIRS on GE website though 1.3.2018.
    - Not found 11.12.2018
- T.OxTM Tissue Oximeter
    - ViOptix Inc, Fremont, Ca
    - http://www.vioptix.com/
    - Studies on monitoring free microsurgical flaps, no potential references 1.3.2018, 11.12.2018.
- CareGuide 1100 tissue oximeter
    - Reflectance Medical, Inc., Westborough, MA
    - http://www.reflectancemedical.com/ourtechnology.php, website disabled 1.3.2018. → ilmeisesti Zoll ostanut?
    - https://www.zoll.com/news-releases/2013/04/18/mobile-careguide-sensor-monitor-defibrillators/
    - No references 1.3.2018, 11.12.2018.
- Nonin Medical Inc.
    - Plymouth, MN, USA
    - http://www.nonin.com/RegionalOximetry
    - http://www.sensmart.com/
    - No potential references 1.3.2018, 11.12.2018.

MANUAL SEARCH OF KEY JOURNALS:

Intensive care medicine:

- American Journal of Respiratory and Critical Care Medicine, search date 27.01.2017, 11.12.2018
    - Volumes 193-197, issues 1-12
    - Volume 198, issues 1-11
    - No potential references, only few abstracts
- Intensive Care Medicine, search date 27.01.2017, 11.12.2018
    - Volumes 42-44, issues 1-12
    - No potential references
- Critical Care Medicine, search date 15.02.2017, 11.12.2018
    - Volumes 44-46, issues 1-12
    - One potential reference [4]
- Chest, search date 16.02.2017, 11.12.2018
    - Volumes 149-154, issues 1-6
    - No potential references
- Clinical Journal of the American Society of Nephrology, search date 16.02.2017, 11.12.2018
    - 2016-2018, January-December
    - No potential references
- Critical Care, search date 16.02.2017, 11.12.2018
    - Volumes 20-22
    - Three potential references [5-7]

Anaesthesiology:

- British Journal of Anaesthesia, search date 16.02.2017, 11.12.2018
    - Volumes 116-121, issues 1-6
    - No potential references
- Anesthesiology, search date 16.02.2017, 11.12.2018
    - Volumes 124-129, issues 1-6
    - One potential reference [8]
- Anaesthesia, search date 16.02.2017, 11.12.2018
    - Volumes 71-74, issues 1-12
    - No potential references
- Anesthesia and Analgesia, search date 16.02.2017, 11.12.2018
    - Volumes 122-127, issues 1-6
    - One potential reference [9]
- Acta Anaesthesiologica Scandinavica, search date 16.02.2017, 11.12.2018
    - Volumes 60-62, issues 1-10
    - No potential references
- Journal of Cardiothoracic and Vascular Anesthesia, search date 17.02.2017
    - Volumes 30-32, issues 1-6
    - No potential references

Cardiology and cardiothoracic surgery:

- Journal of the American College of Cardiology, search date 17.02.2017, 11.12.2018

    - Volumes 68-72, issues 1-25
    - No potential references
- Circulation, search date 15.03.2017, 11.12.2018
    - Volumes 133-138, issues 1-25
    - No potential references
- European Heart Journal, search date 15.03.2017, 11.12.2018
    - Volume 37-39, issues 1-48
    - No potential references
- Circulation Research, search date 15.03.2017, 11.12.2018
    - Volumes 118-123, issues 1-12
    - No potential references
- JACC: Cardiovascular Interventions, search date 15.03.2017, 11.12.2018
    - Volumes 9-11, issues 1-24
    - No potential references
- JACC: Heart Failure, search date 15.03.2017, 11.12.2018
    - Volumes 4-6, issues 1-12
    - No potential references

Emergency medicine:

- Resuscitation, search date 17.02.2017, 11.12.2018
    - Volumes 93-133
    - One potential reference [10]
- Annals of Emergency Medicine, search date 15.03.2017, 11.12.2018
    - Volumes 67-72, issues 1-6
    - No potential references
- Critical Care and Resuscitation, search date 15.03.2017, 11.12.2018
    - 2016-2017, issues 1-4
    - 2018, issues 1-3
    - One potential reference [11]
- Prehospital Emergency Care, search date 15.03.2017, 11.12.2018
    - Volumes 20-22, issues 1-6
    - No potential references
- Academic Emergency Medicine, search date 15.03.2017, 11.12.2018
    - Volumes 23-25, issues 1-12
    - Two potential references [12, 13]
- Shock, search date 15.03.2017, 11.12.2018
    - Volumes 45-50, issues 1-6
    - Two potential references [14, 15]

SEARCH FROM REFERENCE LISTS:

- Searched article (reference number)
    - Potential additional references

Review-articles:

- Salcedo [2]
    - 51. Sagraves SG, Newell MA, Bard MR, et al. Tissue oxygenation mon- itoring in the field: a new EMS vital sign. J Trauma 2009; 67(3):441– 443; discussion 443–444. 52.
    - Beekley AC, Martin MJ, Nelson T, et al. Continuous noninvasive tissue oximetry in the early evaluation of the combat casualty: a prospective study. J Trauma 2010; 69(Suppl 1):S14–25. 57.
    - Miner J, Nelson R, Hayden L. The effect of near infrared spectroscopy monitoring on the treatment of patients presenting to the emergency department in shock. Crit Care Med 2010; 38(12):S861.
- Alqahtani [16]
    - 16. Steiner LA, Pfister D, Strebel SP, et al. Near-infrared spectroscopy can monitor dynamic cerebral autoregulation in adults. Neurocrit Care 2009;10:122–8.
    - 17. Zatmari S, Vegh T, Csomos A, et al. Impaired cerebrovascular reactivity in sepsis-associated encephalopathy studied by acetazolamide test. Crit Care 2010;14:R50. http://dx.doi.org/ 10.1186/cc8939. Epub 2010 Mar 31.
    - 18. Schramm P, Klein KU, Falkenberg L, et al. Impaired cerebrovascular autoregulation in patients with severe sepsis and sepsis-associated delirium. Crit Care 2012;16:R181.
- Anderws[17]
    - none
- Annane[18]
    - 7. Nardi O, Gonzalez H, Fayssoil A, et al: Masseter muscle oxygen saturation is associated with central venous oxygen saturation in patients with severe sepsis. J Clin Monit Comput 2010; 24:289–293
- Arafat[19]
    - none
- Biedrzycka[20]
    - 35. Gómez H, Torres A, Polanco P et al.: Use of non-invasive NIRS during a vascular occlusion test to assess dynamic tissue O2 saturation response. Intensive Care Med 2008; 34: 1600−1607. doi: 10.1007/s00134-008-1145-1.
    - 36. Vallet B: Vascular reactivity and tissue oxygenation. Intensive Care Med 1998; 24: 3−11.
- Bilkovski[21]
    - 61 Beilman GJ, et al.: Near-infrared spectroscopy measurement of regional tis- sue oxyhemoglobin saturation during hemorrhagic shock. Shock 1999, 12:196–200.
    - 62 Crookes BA, et al.: Noninvasive muscle oxygenation to guide fluid resuscitation after traumatic shock. Surgery 2004, 135:662–670.
- Creteur [22]
    - 6 Crookes BA, Cohn SM, Bloch S, et al. Can near-infrared spectroscopy identify the severity of shock in trauma patients? J Trauma 2005; 58:806–813.
- De Backer[23]

- No references
- Drayna[1]
  - 59. Narotam PK, Morrison JF, Nathoo N. Brain tissue oxygen monitoring in traumatic brain injury and major trauma: outcome analysis of a brain tissue oxygen directed therapy. J Neurosurg. 2009;111(4):672Y682.
  - 69. Brady KM ,Lee JK ,Kibler KK, et al. Continuous measurement of autoregulation by spontaneous fluctuations in cerebral perfusion pressure: comparison of 3 methods. Stroke. 2008;39(9):2531Y2537.
  - 70. Brady KM, Lee JK, Kibler KK, et al. Continuous time-domain analysis of cerebrovascular autoregulation using near-infrared spectroscopy. Stroke. 2007;38(10):2818Y2825.
  - 71. Cohn SM, Crookes BA, Proctor KG. Near-infrared spectroscopy in resuscitation. J Trauma. 2003;54(suppl 5):S199YS202.
  - 72. Cohn SM, Varela JE, Giannotti G, et al. Splanchnic perfusion evaluation during hemorrhage and resuscitation with gastric near-infrared spectroscopy. J Trauma. 2001;50(4):629Y634.
  - 73. Varela JE, Cohn SM, Diaz I, et al.Splanchnic perfusion during delayed, hypotensive, or aggressive fluid resuscitation from uncontrolled hemorrhage. Shock. 2003;20(5):476Y480.
  - 77. Lee J, Kim JG, Mahon S, et al. Tissue hemoglobin monitoring of progressive central hypovolemia in humans using broadband diffuse optical spectroscopy. J Biomed Opt. 2008;13(6):064027.
- Al Tayar[24]
  - [16] Ostadal P, Kruger A, Vondrakova D, et al. Noninvasive assessment of hemodynamic variables using near-infrared spectroscopy in patients experiencing cardiogenic shock and individuals undergoing venoarterial extracorporeal membrane oxygenation. J Crit Care 2014;690:11–5.
- Bazerbashi [25]
  - [6] Vorwerk C, Coats TJ. The prognostic value of tissue oxygen saturation in emergency department patients with severe sepsis or septic shock. Emerg Med J 2010;29(9):699–703.
- Leone [26]
  - No references
- Ward [27]
  - No potential references found
- Strehlow [28]
  - No potential references found
- Scheeren [29]
  - No references
- Gerovasili [30]
  - no references
- Ghanayem [31]
  - Torello F, Cowley RD, Thorniley MS, et al: Regional tissue oxygenation during hemorrhage: Can near infrared spectroscopy be used to monitor blood loss? Shock 2002; 18:440 – 444
- Green[32]

    - 64. Veening A, Ince C, Bakker J. Incidence of a low tissue oxy- gen saturation in a mixed population of critically ill patients. *Critical Care*. 2010;14(suppl 1):P151. doi:10.1186/cc8383.
    - 71. Kwon Y, Lee SH, Ryoo HC, Patrick H. Noninvasive thenar muscle tissue oxygen saturation as a surrogate of central venous oxygen saturation in patients with severe sepsis: 223- T. *Crit Care Med*. 2005;33(12):A167.
    - 72. Napoli AM, Machan JT, Forcada A, Corl K, Gardiner F. Tissue oxygenation does not predict central venous oxy- genation in emergency department patients with severe sepsis and septic shock. *Acad Emerg Med*. 2010;17:349-352. doi:10.1111/j.1553-2712.2010.00701.x.
    - 74. Allan C, Philips H, Kemp J, Celinski M, Jonas M. Near infrared spectroscopy (NIRS) and its comparison with traditional parameters of oxygen delivery in septic intensive care patients. *Int Care Med*. 2009;35(suppl 1):S28. Meeting abstract
- Hameed [33]
    - No references
- Haseeb [34]
    - No references
- Huang [35]
    - No references
- Jones [36]
    - No references
- Keegan[8]
    - No references
- Lima [37]
    - 7. Damiani E, Adrario E, Luchetti MM, et al. Plasma free hemoglobin and microcirculatory response to fresh or old blood transfusions in sepsis. PLoS One 2015; 10:e0122655.
- Lima[38]
    - No references
- Lipcsey [39]
    - 32. Futier E, Christophe S, Robin E, Petit A, Pereira B, Desbordes J, Bazin JE, Vallet B: Use of near-infrared spectroscopy during a vascular occlusion test to assess the microcirculatory response during fluid challenge. Crit Care 2011, 15:R214.
    - 59. Heyer L, Mebazaa A, Gayat E, Resche-Rigon M, Rabuel C, Rezlan E, Lukascewicz AC, Madadaki C, Pirracchio R, Schurando P, et al: Cardiac troponin and skeletal muscle oxygenation in severe post-partum haemorrhage. Crit Care 2009, 13(Suppl 5):S8.
- Macdonald [40]
    - 28 Crawford J, Otero R, Rivers EP, et al. Near-infrared spectroscopy as a potential surrogate for mixed venous oxygen saturation for evaluation of patients with hemodynamic derangements. Critical Care 2008;12:P69.
- Mayer [41]
    - No references
- Mesquida [42]
    - No references
- Mesquida [43]

    - [28] P. Rhee, L. Langdale, C. Mock, and L. M. Gentilello, “Near- infrared spectroscopy: continuous measurement of cytochrome oxidation during hemorrhagic shock,” Critical Care Medicine, vol. 25, no. 1, pp. 166–170, 1997.
    - [40] J. Smith, S. Bricker, and B. Putnam, “Tissue oxygen satura- tion predicts the need for early blood transfusion in trauma patients,” American Surgeon, vol. 74, no. 10, pp. 1006–1011, 2008.
- Mozina [44]
    - No references
- Mozina [45]
    - 41. Boekstegers P, Weidenhofer S, Pilz G, Werdan K. Peripherial oxygen availability within skeletal muscle in sepsis and septic shock: comparison to limited infection and cardiogenic shock. Infection 1991;19:317-23.
- Neto [46]
    - No references
- Santora [47]
    - 9. Taylor JH, Mulier KE, Myers DE, Beilman GJ: Use of near infrared spectroscopy in early determination of irreversible hemor- rhagic shock. J Trauma 2005, 58:1119-1125.
- Boushel [48]
    - None
- Boushel [49]
    - None
- Murkin [50]
    - None

Fulltext articles searched:

- Cohn [51]
    - No references
- Vallet [52]
    - No references
- Ait oufella [53]
    - None
- Al tayar [24]
    - None
- Arakaki [14]
    - 23. Iyegha UP, Conway T, Pokorney K, Mulier KE, Nelson TR, Beilman GJ: Low StO2 measurements in surgical intensive care unit patients is associated with poor outcomes. *J Trauma Acute Care Surg* 76(3): 809-16, 2014.
    - 24. Khasawneh MA, Zielinski MD, Jenkins DH, Zietlow SP, Schiller HJ, Rivera M: Low tissue oxygen saturation is associated with requirements for transfusion in the rural trauma population. *World J Surg* 38(8): 1892-7, 2014.
- Beilman[54]
    - None
- Bindra [55]
    - None
- Claverias [56]
    - None

- Cohn [57]
    - None
- Colin [58]
    - None
- Conrad [59]
    - None
- Creteur [60]
    - 26. Boushel R, Langberg H, Olesen J, Gonzales-Alonzo J, Bulow J, Kjaer M (2001) Monitoring tissue oxygen avail- ability with near infrared spectroscopy (NIRS) in health and disease. Scand J Med Sci Sports 11:213–222
- Crookes [61]
    - Torella F, Cowley R, Thorniley MS, McCollum CN. Monitoring blood loss with near infrared spectroscopy. Eur J Appl Physiol. 2001;84:158 –161.
- De Blasi [3]
    - 16. De Blasi RA, Ferrari M, Natali A, Conti G, Mega A, Gasparetto A (1994) Non-invasive measurement of forearm blood flow and oxygen consumption by near-infrared spectroscopy. J Appl Physiol 76:1388–1393
    - 17. De Blasi RA, Quaglia E, Ferrari M (1991) Skeletal muscle oxygenation monitoring by near infrared spectroscopy. Biochem Int 25:241–245
    - 20. Van Beekvelt MCP, Colier WN, Wev- ers RA, Van Engelen GM (2001) Per-formance of near-infrared spectroscopy in measuring local O2 consumption and blood flow in skeletal muscle. J Appl Physiol 90:511–519
- Doerschug [62]
    - 25. Gomez H, Mesquida J, Simon P, Kim H, Puyana J, Ince C, Pinsky M: Characterization of tissue oxygen saturation and the vascular occlusion test: influence of measurement sites, probe sizes and deflation thresholds. Critical Care 2009, 13:S3.
    - 29. Jhanji S, Stirling S, Patel N, Hinds CJ, Pearse RM: The effect of increasing doses of norepinephrine on tissue oxygenation and microvascular flow in patients with septic shock. Crit Care Med 2009, 37:1961-1966.
- Doerschug [62]
    - 6. Boushel R, Piantadosi CA. Near-infrared spectroscopy for monitoring muscle oxygenation. Acta Physiol Scand 168: 615–622, 2000.
- Duret [63]
    - 16. Wariar R, Gaffke JN, Haller RG, Bertocci LA. A modular NIRS system for clinical measurement of impaired skeletal muscle oxygenation. J Appl Physiol. 2000;88:315–25.
    - 22. Murkin JM, Arango M. Near-infrared spectroscopy as an index of brain and tissue oxygenation. Br J Anaesth. 2009;103:i3–i13.
- Georger [64]
    - 24. Dubin A, Pozo MO, Casabella CA, Palizas F Jr, Murias G, Moseinco MC, Kanoore Edul VS, Palizas F, Estenssoro E, Ince C (2009) Increasing arterial blood pressure with norepinephrine does not improve microcirculatory blood flow: a prospective study. Crit Care 13:R92
- Koch [65]
    - None
- Lima [66]

    - None
- Luengo [67]
    - 25. Soller BR, Ryan KL, Rickards CA, Cooke WH, Yang Y, Soyemi OO, Crookes BA, Heard SO, Convertino VA. Oxygen saturation determined from deep muscle, not thenar tissue, is an early indicator of central hypovolemia in humans. Crit Care Med. 2008;36:176–82.
- Marin-Corral [68]
    - None
- Mayeur [69]
    - 11. Creteur J, Neves AP, Vincent JL: Near- infrared spectroscopy technique to evaluate the effects of red blood cell transfusion on tissue oxygenation. Crit Care 2009; 13(Suppl 5):S11
- Mesquida [70]
    - None
- Mesquida [71]
    - None
- Mesquida [72]
    - 6. Beilman GJ, Groehler KE, Lazaron V, Ortner JP (1999) NIRS measurement of regional tissue oxyhemoglobin saturation during hemorrhagic shock. Shock 12:196–200
    - 12. Mesquida J, Masip J, Sabatier C, Gili G, Baigorri F, Artigas A (2006) Oxygen tissular saturation measured by NIRS in patients admitted to the intensive care unit. Intensive Care Med (Suppl) 19. 32:S167
    - 13. Mesquida J, Masip J, Gili G, Sabatier C, Baigorri F, Artigas A (2008) Tissue oxygen saturation measured by near- infrared spectroscopy as a non-invasive predictor of low central venous oxygen 20. saturation: a useful parameter in our resuscitation algorithm? AJRCCM 177:A366
- Moore [73]
    - None
- Mozina [74]
    - None
- Nanas [75]
    - 34. Sair M. Ethcrington PJ, Peter Wlnlove C, Evans TW. Tissue oxygénation and perfusion in patients with systemic sepsis. Crit Care Med 2001;29:1343-1349.
- Napoli [76]
    - None
- Neto [46]
    - None
- Nicks [77]
    - None
- Orbegozo [78]
    - None
- Payen [79]
    - Neviere R, Mathieu D, Chagnon JL, Lebleu N, Millien JP, Wattel F: Skeletal muscle microvascular blood flow and oxygen trans- port in patients with severe sepsis. Am J Respir Crit Care Med 1996, 153:191-195.
- Rodriques [80]

    - 5. Muellner T, Nikolic A, Schramm W, Ve´csei V. New instrument that uses near-infrared spectroscopy for the monitoring of human muscle oxygenation. J Trauma. 1999;46:1082–1084.
- Shapiro [81]
    - 5. Hamaoka T, McCully KK, Quaresima V, Yamamoto K, Chance B: Near- infrared spectroscopy/imaging for monitoring muscle oxygenation and oxidative metabolism in healthy and diseased humans. J Biomed Opt 2007, 12:062105.
- Strahovnik [82]
    - None
- Thooft [83]
    - None
- Wood [84]
    - None!
- Yolcu[85]
    - [86]
- Bendahan [87]
    - Wood MD, Maslove DM, Muscedere JG, Day AG, Gordon Boyd J. Low brain tissue oxygenation contributes to the development of delirium in critically ill patients: a prospective observational study. J Crit Care. 2017;41:289-295. doi:10.1016/j.jcrc.2017. 06.009
    - 23. Petroni T, Harrois A, Amour J, et al. Intra-aortic balloon pump effects on macrocirculation and microcirculation in cardiogenic shock patients supported by venoarterial extracorporeal membrane oxygenation*. Crit Care Med. 2014;42(9):2075-2082. doi:10.1097/CCM.0000000000000410
    - 24. Pfister D, Siegemund M, Dell-Kuster S, et al. Cerebral perfusion in sepsis-associated delirium. Crit Care. 2008;12(3): R63. doi:10.1186/cc689125. Vasko´ A, Siro´ P, La´szlo´ I, et al. Assessment of cerebral tissue oxygen saturation in septic patients during acetazolamide provo- cation - a near infrared spectroscopy study. Acta Physiol Hung. 2014;101(1):32-39. doi:10.1556/APhysiol.101.2014.1.4
- Charlton [88]
    - None
- Fathi [89]
    - 28 Plomgaard AM, van Oeveren W, Petersen TH, Alderliesten T, Austin T, van Bel F, Benders M, Claris O, Dempsey E, Franz A, Fumagalli M, Gluud C, Hagmann C, Hyttel-Sorensen S, Lemmers P, Pellicer A, Pichler G, Winkel P, Greisen G. The SafeBoosC II randomized trial: treatment guided by near-infrared spectroscopy reduces cerebral hypoxia without changing early biomarkers of brain injury. *Pediatr Res* 2016; **79**: 528-535 [PMID: 26679155 DOI: 10.1038/pr.2015.266]
- Li [90]
    - None
- Podbregar [91]
    - None
- Tafner [92]
    - None
- Petroni [93]
    - None
- Perez [86]

- None

References

1. Drayna PC, Abramo TJ, Estrada C: **Near-infrared spectroscopy in the critical setting**. *Pediatr Emerg Care* 2011, **27**(5):432-442.
2. Salcedo MC, Tart K, Hall K: **A systematic review of human and veterinary applications of noninvasive tissue oxygen monitoring**. *Journal of veterinary emergency & critical care* 2016, **26**(3):323-332.
3. De Blasi RA, Palmisani S, Alampi D, Mercieri M, Romano R, Collini S, Pinto G: **Microvascular dysfunction and skeletal muscle oxygenation assessed by phase-modulation near-infrared spectroscopy in patients with septic shock**. *Intensive Care Med* 2005, **31**(12):1661-1668.
4. Parnia S, Yang J, Nguyen R, Ahn A, Zhu J, Inigo-Santiago L, Nasir A, Golder K, Ravishankar S, Bartlett P *et al*: **Cerebral Oximetry During Cardiac Arrest: A Multicenter Study of Neurologic Outcomes and Survival**. *Crit Care Med* 2016, **44**(9):1663-1674.
5. Donati A, Damiani E, Domizi R, Scorcella C, Carsetti A, Tondi S, Monaldi V, Adrario E, Romano R, Pelaia P *et al*: **Near-infrared spectroscopy for assessing tissue oxygenation and microvascular reactivity in critically ill patients: a prospective observational study**. *Crit Care* 2016, **20**(1):311.
6. Genbrugge C, Eertmans W, Meex I, Van Kerrebroeck M, Daems N, Creemers A, Jans F, Boer W, Dens J, De Deyne C: **What is the value of regional cerebral saturation in post-cardiac arrest patients? A prospective observational study**. *Crit Care* 2016, **20**(1):327.
7. Crippa IA, Subirà C, Vincent J-L, Fernandez RF, Hernandez SC, Cavicchi FZ, Creteur J, Taccone FS: **Impaired cerebral autoregulation is associated with brain dysfunction in patients with sepsis**. *Critical Care* 2018, **22**(1):327.
8. Deschamps A, Hall R, Grocott H, Mazer CD, Choi PT, Turgeon AF, de Medicis E, Bussieres JS, Hudson C, Syed S *et al*: **Cerebral Oximetry Monitoring to Maintain Normal Cerebral Oxygen Saturation during High-risk Cardiac Surgery**. *Anesthesiology* 2016, **124**(4):826-836.
9. Subramanian B, Nyman C, Fritock M, Klinger RY, Sniecinski R, Roman P, Huffmyer J, Parish M, Yenokyan G, Hogue CW: **A Multicenter Pilot Study Assessing Regional Cerebral Oxygen Desaturation Frequency During Cardiopulmonary Bypass and Responsiveness to an Intervention Algorithm**. *Anesth Analg* 2016, **122**(6):1786-1793.
10. Eastwood GM, Tanaka A, Bellomo R: **Cerebral oxygenation in mechanically ventilated early cardiac arrest survivors: The impact of hypercapnia**. *Resuscitation* 2016, **102**:11-16.
11. Bindra J, Pham P, Chuan A, Jaeger M, Aneman A: **Is impaired cerebrovascular autoregulation associated with outcome in patients admitted to the ICU with early septic shock?** *Crit Care Resusc* 2016, **18**(2):95-101.
12. Reisner AT, Edla S, Liu J, Rubin JT, Thorsen JE, Kittell E, Smith JB, Yeh DD, Reifman J: **Muscle Oxygen Saturation Improves Diagnostic Association Between Initial Vital Signs and Major Hemorrhage: A Prospective Observational Study**. *Acad Emerg Med* 2016, **23**(3):353-357.
13. Cournoyer A, Iseppon M, Chauny JM, Denault A, Cossette S, Notebaert E: **Near-infrared Spectroscopy Monitoring During Cardiac Arrest: A Systematic Review and Meta-analysis**. *Acad Emerg Med* 2016, **23**(8):851-862.
14. Arakaki LS, Bulger EM, Ciesielski WA, Carlbom DJ, Fisk DM, Sheehan KJ, Asplund KM, Schenkman KA: **Muscle Oxygenation as an Early Predictor of Shock Severity in Trauma Patients**. *Shock* 2016.
15. Howard JT, Janak JC, Hinojosa-Laborde C, Convertino VA: **Specificity of Compensatory Reserve and Tissue Oxygenation as Early Predictors of Tolerance to Progressive Reductions in Central Blood Volume**. *Shock* 2016, **46**(3 Suppl 1):68-73.

16. Alqahtani MF, Wainwright MS: **Sepsis-associated neurologic dysfunction**. *Clin Pediatr Emerg Med* 2015, **16**(1):62-68.
17. Andrews P, Azoulay E, Antonelli M, Brochard L, Brun-Buisson C, De Backer D, Dobb G, Fagon JY, Gerlach H, Groeneveld J *et al*: **Year in review in Intensive Care Medicine, 2006. I. Experimental studies. Clinical studies: Brain injury, renal failure and endocrinology**. *Intensive Care Med* 2007, **33**(1):49-57.
18. Annane D: **Thenar tissue oxygen saturation monitoring: Noninvasive does not mean simple or accurate!** *Crit Care Med* 2011, **39**(7):1828-1829.
19. Arafat FO, Beilman GJ: **Monitoring and managing the critically Ill patient in the intensive care unit**. In: *Handbook of Cardiac Anatomy, Physiology, and Devices, Third Edition.* 2015: 399-410.
20. Biedrzycka A, Lango R: **Tissue oximetry in anaesthesia and intensive care**. *Anaesthesiology intensive therapy* 2016, **48**(1):41-48.
21. Bilkovski RN, Rivers EP, Horst HM: **Targeted resuscitation strategies after injury**. *Curr Opin Crit Care* 2004, **10**(6):529-538.
22. Creteur J: **Muscle StO2 in critically ill patients**. *Curr Opin Crit Care* 2008, **14**(3):361-366.
23. De Backer D, Ospina-Tascon G, Salgado D, Favory R, Creteur J, Vincent JL: **Monitoring the microcirculation in the critically ill patient: Current methods and future approaches**. In: *Applied Physiology in Intensive Care Medicine 2: Physiological Reviews and Editorials.* 2012: 263-275.
24. Al Tayar A, Abouelela A, Mohiuddeen K: **Can the cerebral regional oxygen saturation be a perfusion parameter in shock?** *J Crit Care* 2016, **38**:164-167.
25. Bazerbashi H, Merriman KW, Toale KM, Chaftari P, Cruz Carreras MT, Henderson JD, Yeung SC, Rice TW: **Low tissue oxygen saturation at emergency center triage is predictive of intensive care unit admission**. *J Crit Care* 2014, **29**(5):775-779.
26. Leone M, Blidi S, Antonini F, Meyssignac B, Bordon S, Garcin F, Charvet A, Blasco V, Albanese J, Martin C: **Oxygen tissue saturation is lower in nonsurvivors than in survivors after early resuscitation of septic shock**. *Anesthesiology* 2009, **111**(2):366-371.
27. Ward KR, Ivatury RR, Barbee RW, Terner J, Pittman R, Filho IP, Spiess B: **Near infrared spectroscopy for evaluation of the trauma patient: a technology review**. *Resuscitation* 2006, **68**(1):27-44.
28. Strehlow MC: **Early Identification of Shock in Critically Ill Patients**. *Emerg Med Clin North Am* 2010, **28**(1):57-66.
29. Scheeren TWL, Schober P, Schwarte LA: **Monitoring tissue oxygenation by near infrared spectroscopy (NIRS): Background and current applications**. *J Clin Monit Comput* 2012, **26**(4):279-287.
30. Gerovasili V, Dimopoulos S, Tzanis G, Anastasiou-Nana M, Nanas S: **Utilizing the vascular occlusion technique with NIRS technology**. *Int J Ind Ergon* 2010, **40**(2):218-222.
31. Ghanayem NS, Wernovsky G, Hoffman GM: **Near-infrared spectroscopy as a hemodynamic monitor in critical illness**. *Pediatr Crit Care Med* 2011, **12**(4 Suppl):S27-32.
32. Green MS, Sehgal S, Tariq R: **Near-Infrared Spectroscopy: The New Must Have Tool in the Intensive Care Unit?** *Semin Cardiothorac Vasc Anesth* 2016, **20**(3):213-224.
33. Hameed SM, Aird WC, Cohn SM: **Oxygen delivery**. *Crit Care Med* 2003, **31**(12 Suppl):S658-667.
34. Haseeb F, Reay M: **Haemodynamics and cardiovascular shock**. *Surgery (United Kingdom)* 2015, **33**(10):467-473.

35. Huang YC: **Monitoring oxygen delivery in the critically ill**. *Chest* 2005, **128**(5 Suppl 2):554S-560S.
36. Jones N, Terblanche M: **Tissue saturation measurement--exciting prospects, but standardisation and reference data still needed**. *Crit Care* 2010, **14**(3):169.
37. Lima A: **Current status of tissue monitoring in the management of shock**. *Curr Opin Crit Care* 2016, **22**(3):274-278.
38. Lima A, Bakker J: **Noninvasive monitoring of peripheral perfusion**. *Intensive Care Med* 2005, **31**(10):1316-1326.
39. Lipcsey M, Woinarski NC, Bellomo R: **Near infrared spectroscopy (NIRS) of the thenar eminence in anesthesia and intensive care**. *Annals of intensive care* 2012, **2**(1):11.
40. Macdonald SP, Brown SG: **Near-infrared spectroscopy in the assessment of suspected sepsis in the emergency department**. *Emerg Med J* 2015, **32**(5):404-408.
41. Mayer K, Trzeciak S, Puri NK: **Assessment of the adequacy of oxygen delivery**. *Curr Opin Crit Care* 2016, **22**(5):437-443.
42. Mesquida J: **Evaluating tissue oxygenation at the bedside: global, regional, or both?** *J Clin Monit Comput* 2015, **29**(4):431-433.
43. Mesquida J, Gruartmoner G, Espinal C: **Skeletal muscle oxygen saturation (StO2) measured by near-infrared spectroscopy in the critically ill patients**. *BioMed Research International* 2013, **2013**.
44. Mozina H, Podbegar M: **Near-infrared spectroscopy for evaluation of global and skeletal muscle tissue oxygenation**. *World J Cardiol* 2011, **3**(12):377-382.
45. Možina H, Podbegar M: **Near infrared spectroscopy for evaluation of skeletal muscle tissue oxygenation in different types of shock**. *Signa Vitae* 2015, **10**(1):10-24.
46. Neto AS, Pereira VG, Manetta JA, Esposito DC, Schultz MJ: **Association between static and dynamic thenar near-infrared spectroscopy and mortality in patients with sepsis: a systematic review and meta-analysis**. *The journal of trauma and acute care surgery* 2014, **76**(1):226-233.
47. Santora RJ, Moore FA: **Monitoring trauma and intensive care unit resuscitation with tissue hemoglobin oxygen saturation**. *Crit Care* 2009, **13 Suppl 5**.
48. Boushel R, Langberg H, Olesen J, Gonzales-Alonzo J, Bulow J, Kjaer M: **Monitoring tissue oxygen availability with near infrared spectroscopy (NIRS) in health and disease**. *Scand J Med Sci Sports* 2001, **11**(4):213-222.
49. Boushel R, Piantadosi CA: **Near-infrared spectroscopy for monitoring muscle oxygenation**. *Acta Physiol Scand* 2000, **168**(4):615-622.
50. Murkin JM, Arango M: **Near-infrared spectroscopy as an index of brain and tissue oxygenation**. *Br J Anaesth* 2009, **103 Suppl 1**:i3-13.
51. Cohn SM, Crookes BA, Proctor KG: **Near-infrared spectroscopy in resuscitation**. *J Trauma* 2003, **54**(5 Suppl):S199-202.
52. Vallet B: **Vascular reactivity and tissue oxygenation**. *Intensive Care Med* 1998, **24**(1):3-11.
53. Ait-Oufella H, Joffre J, Boelle PY, Galbois A, Bourcier S, Baudel JL, Margetis D, Alves M, Offenstadt G, Guidet B *et al*: **Knee area tissue oxygen saturation is predictive of 14-day mortality in septic shock**. *Intensive Care Med* 2012, **38**(6):976-983.
54. Beilman GJ, Blondet JJ, Nelson TR, Nathens AB, Moore FA, Rhee P, Puyana JC, Moore EE, Cohn SM: **Early hypothermia in severely injured trauma patients is a significant risk factor for multiple organ dysfunction syndrome but not mortality.[Erratum appears in Ann Surg. 2009 Oct;250(4):661]**. *Ann Surg* 2009, **249**(5):845-850.

55. Bindra J, Pham P, Chuan A, Jaeger M, Aneman A: **Is impaired cerebrovascular autoregulation associated with outcome in patients admitted to the ICU with early septic shock?** *Crit Care Resusc* 2016, **18**(2):98-101.
56. Claverias L, Mari M, Marin-Corral J, Magret M, Trefler S, Bodi M, Garcia-Espana A, Yebenes JC, Pascual S, Gea J *et al*: **The prognostic value of muscle regional oxygen saturation index in severe community-acquired pneumonia: a prospective observational study**. *Journal of intensive care* 2016, **4**:7.
57. Cohn SM, Nathens AB, Moore FA, Rhee P, Puyana JC, Moore EE, Beilman GJ, McCarthy J, Jonas RB, Johnston J *et al*: **Tissue oxygen saturation predicts the development of organ dysfunction during traumatic shock resuscitation**. *Journal of Trauma - Injury, Infection and Critical Care* 2007, **62**(1):44-54.
58. Colin G, Nardi O, Polito A, Aboab J, Maxime V, Clair B, Friedman D, Orlikowski D, Sharshar T, Annane D: **Masseter tissue oxygen saturation predicts normal central venous oxygen saturation during early goal-directed therapy and predicts mortality in patients with severe sepsis**. *Crit Care Med* 2012, **40**(2):435-440.
59. Conrad M, Perez P, Thivilier C, Levy B: **Early prediction of norepinephrine dependency and refractory septic shock with a multimodal approach of vascular failure**. *J Crit Care* 2015, **30**(4):739-743.
60. Creteur J, Carollo T, Soldati G, Buchele G, De Backer D, Vincent JL: **The prognostic value of muscle StO2 in septic patients**. *Intensive Care Med* 2007, **33**(9):1549-1556.
61. Crookes BA, Cohn SM, Bloch S, Amortegui J, Manning R, Li P, Proctor MS, Hallal A, Blackbourne LH, Benjamin R *et al*: **Can near-infrared spectroscopy identify the severity of shock in trauma patients?** *J Trauma* 2005, **58**(4):806-813; discussion 813-806.
62. Doerschug KC, Delsing AS, Schmidt GA, Ashare A: **Renin-angiotensin system activation correlates with microvascular dysfunction in a prospective cohort study of clinical sepsis**. *Crit Care* 2010, **14**(1):R24.
63. Duret J, Pottecher J, Bouzat P, Brun J, Harrois A, Payen JF, Duranteau J: **Skeletal muscle oxygenation in severe trauma patients during haemorrhagic shock resuscitation**. *Crit Care* 2015, **19**:141.
64. Georger JF, Hamzaoui O, Chaari A, Maizel J, Richard C, Teboul JL: **Restoring arterial pressure with norepinephrine improves muscle tissue oxygenation assessed by near-infrared spectroscopy in severely hypotensive septic patients**. *Intensive Care Med* 2010, **36**(11):1882-1889.
65. Koch C, Rohrig R, Monz T, Hecker A, Uhle F, Schneck E, Weigand MA, Lichtenstern C: **Prospective evaluation of regional oxygen saturation to estimate central venous saturation in sepsis**. *J Clin Monit Comput* 2015, **29**(4):443-453.
66. Lima A, van Bommel J, Jansen TC, Ince C, Bakker J: **Low tissue oxygen saturation at the end of early goal-directed therapy is associated with worse outcome in critically ill patients**. *Crit Care* 2009, **13 Suppl 5**:S13.
67. Luengo C, Resche-Rigon M, Damoisel C, Kerever S, Creteur J, Payen D: **Comparison of two different generations of "nIRS" devices and transducers in healthy volunteers and ICU patients**. *J Clin Monit Comput* 2013, **27**(1):71-79.
68. Marin-Corral J, Claverias L, Bodi M, Pascual S, Dubin A, Gea J, Rodriguez A: **Prognostic value of brachioradialis muscle oxygen saturation index and vascular occlusion test in septic shock patients**. *Med Intensiva* 2016, **40**(4):208-215.

69. Mayeur C, Campard S, Richard C, Teboul JL: **Comparison of four different vascular occlusion tests for assessing reactive hyperemia using near-infrared spectroscopy**. *Crit Care Med* 2011, **39**(4):695-701.
70. Mesquida J, Espinal C, Gruartmoner G, Masip J, Sabatier C, Baigorri F, Pinsky MR, Artigas A: **Prognostic implications of tissue oxygen saturation in human septic shock**. *Intensive Care Med* 2012, **38**(4):592-597.
71. Mesquida J, Gruartmoner G, Martinez ML, Masip J, Sabatier C, Espinal C, Artigas A, Baigorri F: **Thenar oxygen saturation and invasive oxygen delivery measurements in critically ill patients in early septic shock**. *Shock* 2011, **35**(5):456-459.
72. Mesquida J, Masip J, Gili G, Artigas A, Baigorri F: **Thenar oxygen saturation measured by near infrared spectroscopy as a noninvasive predictor of low central venous oxygen saturation in septic patients**. *Intensive Care Med* 2009, **35**(6):1106-1109.
73. Moore FA, Nelson T, McKinley BA, Moore EE, Nathens AB, Rhee P, Puyana JC, Beilman GJ, Cohn SM, St OSG: **Massive transfusion in trauma patients: tissue hemoglobin oxygen saturation predicts poor outcome**. *Journal of Trauma-Injury Infection & Critical Care* 2008, **64**(4):1010-1023.
74. Mozina H, Podbregar M: **Near-infrared spectroscopy during stagnant ischemia estimates central venous oxygen saturation and mixed venous oxygen saturation discrepancy in patients with severe left heart failure and additional sepsis/septic shock**. *Crit Care* 2010, **14**(2):R42.
75. Nanas S, Gerovasili V, Renieris P, Angelopoulos E, Poriazi M, Kritikos K, Siafaka A, Baraboutis I, Zervakis D, Markaki V *et al*: **Non-invasive assessment of the microcirculation in critically ill patients**. *Anaesth Intensive Care* 2009, **37**(5):733-739.
76. Napoli AM, Machan JT, Forcada A, Corl K, Gardiner F: **Tissue oxygenation does not predict central venous oxygenation in emergency department patients with severe sepsis and septic shock**. *Acad Emerg Med* 2010, **17**(4):349-352.
77. Nicks BA, Campons KM, Bozeman WP: **Association of low non-invasive near-infrared spectroscopic measurements during initial trauma resuscitation with future development of multiple organ dysfunction**. *World journal of emergency medicine* 2015, **6**(2):105-110.
78. Orbegozo Cortes D, Puflea F, De Backer D, Creteur J, Vincent JL: **Near infrared spectroscopy (NIRS) to assess the effects of local ischemic preconditioning in the muscle of healthy volunteers and critically ill patients**. *Microvasc Res* 2015, **102**:25-32.
79. Payen D, Luengo C, Heyer L, Resche-Rigon M, Kerever S, Damoisel C, Losser MR: **Is thenar tissue hemoglobin oxygen saturation in septic shock related to macrohemodynamic variables and outcome?** *Crit Care* 2009, **13 Suppl 5**.
80. Rodriguez A, Lisboa T, Martin-Loeches I, Diaz E, Trefler S, Restrepo MI, Rello J: **Mortality and regional oxygen saturation index in septic shock patients: a pilot study**. *Journal of Trauma-Injury Infection & Critical Care* 2011, **70**(5):1145-1152.
81. Shapiro NI, Arnold R, Sherwin R, O'Connor J, Najarro G, Singh S, Lundy D, Nelson T, Trzeciak SW, Jones AE: **The association of near-infrared spectroscopy-derived tissue oxygenation measurements with sepsis syndromes, organ dysfunction and mortality in emergency department patients with sepsis**. *Critical Care* 2011, **15**(5).
82. Strahovnik I, Podbregar M: **Measurement of skeletal muscle tissue oxygenation in the critically ill**. *Signa Vitae* 2008, **3**(1):43-50.
83. Thooft A, Favory R, Salgado DR, Taccone FS, Donadello K, De Backer D, Creteur J, Vincent JL: **Effects of changes in arterial pressure on organ perfusion during septic shock**. *Crit Care* 2011, **15**(5):R222.

84. Wood M, Song A, Maslove D, Ferri C, Howes D, Muscedere J, Boyd JG: **Brain Tissue Oxygenation in Patients with Septic Shock: a Feasibility Study**. *Can J Neurol Sci* 2016, **43**(1):65-73.
85. Yolcu S, Erdur B: **Use of tissue oxygenation (StO2) monitor in the ED**. *Am J Emerg Med* 2014, **32**(8):938-940.
86. Perez P, Kimmoun A, Blime V, Levy B: **Increasing mean arterial pressure in cardiogenic shock secondary to myocardial infarction: effects on hemodynamics and tissue oxygenation**. *Shock* 2014, **41**(4):269-274.
87. Bendahan N, Neal O, Ross-White A, Muscedere J, Boyd JG: **Relationship Between Near-Infrared Spectroscopy-Derived Cerebral Oxygenation and Delirium in Critically Ill Patients: A Systematic Review**. *J Intensive Care Med* 2018:885066618807399.
88. Charlton M, Sims M, Coats T, Thompson JP: **The microcirculation and its measurement in sepsis**. *J Intensive Care Soc* 2017, **18**(3):221-227.
89. Fathi EM, Narchi H, Chedid F: **Noninvasive hemodynamic monitoring of septic shock in children**. *World journal of methodology* 2018, **8**(1):1-8.
90. Li T, Zhong F, Pan B, Li Z, Huang C, Deng Z: **A Brief Review of OPT101 Sensor Application in Near-Infrared Spectroscopy Instrumentation for Intensive Care Unit Clinics**. *Sensors (Basel)* 2017, **17**(8):25.
91. Podbregar M: **How i use skeletal muscle near infrared spectroscopy to non-invasively assess hemodynamic status of the critically ill**. *Signa Vitae* 2017, **13**:14-19.
92. Tafner P, Chen FK, Rabello RF, Correa TD, Chaves RCF, Serpa AN: **Recent advances in bedside microcirculation assessment in critically ill patients**. *Revista Brasileira de terapia intensiva* 2017, **29**(2):238-247.
93. Petroni T, Harrois A, Amour J, Lebreton G, Brechot N, Tanaka S, Luyt CE, Trouillet JL, Chastre J, Leprince P *et al*: **Intra-aortic balloon pump effects on macrocirculation and microcirculation in cardiogenic shock patients supported by venoarterial extracorporeal membrane oxygenation***. *Crit Care Med* 2014, **42**(9):2075-2082.