The Current State of Vital Signs – An Integrated Review

Conclusions & Recommendations

Controversy surrounding vital signs has existed for decades. An examination of the current state of vital signs revealed two recent systematic reviews, which thoroughly explored the complexities of this topic, as well as three journal articles focusing on blood pressure measurement issues. The evidence surrounding this issue ranged from insufficient to fair, reflecting the need for more research in this area. The 453 articles included in the two systematic reviews encompassed a total of 23 years of vital signs research. Three recent journal articles reflecting the viewpoints of both nurses and physicians upheld the conclusions reached in the systematic reviews.

Although vital signs are often perceived as a routine function used with community clinic gate keeping and triage review, it forms the foundation of preliminary patient assessment and treatment. It is tempting to view this function as static numbers locked in time; however, vital signs (particularly blood pressure) are fluid and dynamic indicators of patient status. Decisions involving vital signs equipment, methods, frequency protocols, technique, technology, and healthcare worker (HCW) training influence the accuracy of this ever-changing measurement data [1, 5]. These crucial decisions will ultimately affect patient treatment and outcomes.

Key Summary of the Evidence:
- Vital signs are the foundation of clinical assessment and the basis for many clinical decisions, which ultimately impacts patient outcomes.
- Trends more important than any single measurement.
- The communication of vital sign data after it is collected is as important as the accuracy of the vital signs themselves.
- HCW presence, technique, and methods have a definite influence on vital sign measurements.
- Stage 1 HTN is misdiagnosed at least 20% of the time, due to the white coat HTN phenomenon.

Given the above conclusions, the following recommendations are offered for consideration:
- Organizations should promote a standard for vital sign measurement to minimize inaccuracies.
- Vital sign measurements should be based on evidence (pages 2 to 6), rather than ritual, routine, and tradition.
- Clinical decisions should be based on vital sign trends, rather than isolated measurements.
- Vital sign educational programs should be geared towards improving HCW measurement technique, documentation, and communication of vital signs.
- The use of calibrated electronic devices improves the accuracy of vital sign measurements [1, 2, 3, 5].
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Detailed Summary of the Evidence

- **Measurements Constituting Vital Signs** [2]
  - Vitals signs have traditionally been delineated as temperature, pulse, respirations, and blood pressure.
  - There is much discussion concerning what should constitute the 5th vital sign. Candidates for this designation include pain, nutrition, smoking, spirometry, pulse oximetry, and orthostatic blood pressure/heart rate.
  - What happens to measurement data after collection is as important as the accuracy of the vital signs.

- **Personnel Measuring Vital Signs** [1,2,4,5]
  - The Healthcare Worker (HCW), whether physician, nurse, or assistive personnel, has a definite influence on vital signs.
  - The most influence HCWs have on vital signs can been seen with the auscultation method of BP measurement, which involves HCW observation error, as well as touch and presence.
  - Interactions between the patient and the HCW have a major effect on BP.
  - White coat hypertension (HTN) may contribute as much as 20% towards the misdiagnosis of Stage I HTN.
    - Higher BP's have been measured in clinic and work settings than in familiar settings such as home.
  - Educational programs have been demonstrated to improve HCW measurement techniques.

- **Frequency of Vitals Signs** [2,4]
  - Trends are more important than any single vital sign measurement.
  - Vital signs should NOT be used as a method of ensuring frequent HCW visits.
  - Vital sign parameters do NOT guarantee normal patient physiological status.
    - Have vital signs become a routine procedure unrelated to perceived individual patient needs?
    - Is visual observation more important than routine vital signs?
    - Visual observation of patients should be coupled with vital signs.
  - Despite the above comments, organizations should promote a standardized method of vital sign measurement.

- **Technology** [1,2,3,5]
  - Use of mercury BP device is declining, which necessitates alternative methods of obtaining BP measurements.
  - Automated BP is the most favored method, as seen in convenience, time, and error reduction (one standardized machine vs. many individuals and techniques).
  - BP machines must be individually calibrated for accuracy.
o Oscillometric method of BP can be used for office measurement ONLY if devices are independently validated according to standard protocols.
o Automated machines can save up to 20 seconds per HCW. However, potential cost savings involving labor and time have yet to be confirmed.
o Infrared and electronic thermometers also are favored by HCW for convenience, time, and accuracy.
o Parents prefer tympanic temperatures for speed, ease, cleanliness, & safety reasons.
o 51% of pediatric patient reacted more positively to tympanic thermometers.
o However, touch was a surprisingly accurate assessment tool to detect fever.
o Pulse oximetry has changed the management of deteriorating patient conditions.

➤ Technique & Methods [1,2,3,4,5]
o Respiratory Rate (RR) [2]
  • RR variability can be reduced by counting for 60 seconds or by multiplying x2 a 30 second count.
  • Shorter time counts result in inaccurate measurements.
  • Pediatric patients with panting respirations should have their RR counted via stethoscope use.
  • Agitation in pediatric patients can result in inaccurate RR.
  • RR is NOT a reliable screen for oxygen desaturation states.

o Pulse (P or HR) [2]
  • Count for 60 seconds or multiple x2 for a 30 second count.
    • Shorter time counts result in inaccurate measurements.
    • If the pulse is abnormal or difficult to palpate, an apical pulse via stethoscope will yield the most accurate measurement of HR.
    • Pulse rates via automatic BP machines were not discussed.

o Blood Pressure (BP) [1,2,3,4,5]
  • Use a consistent method to minimize inaccuracies (whether machine or auscultation).
    • Functional and calibrated machine
    • Korotkoff’s sounds
    • Properly trained HCWs
  • Subject factors such as arm positioning, cuff size, clothing, muscle tension, bladder distension, talking, background noise, room temperature, exercise, anxiety, alcohol/nicotine consumption can cause significant BP measurement deviations.
  • Use bare upper arm with proper support and positioning at heart level, patient sitting, back supported, legs uncrossed, feet on floor, and at rest for 5 minutes.
Use proper cuff size as related to arm circumference.
- Ideal cuff has bladder length that is 80%, and width of at least 40% of arm circumference (length to width ratio of 2:1).
- Ideal ratio to be maintained in all 4 cuff sizes - small adult, adult, large adult, adult thigh.

The use of the righted sized cuff is of paramount importance in the obese patient.

Repeat BPs should be separated by 2 minutes.

BP trends are more important than isolated measurements.

Use of mercury sphygmomanometer is declining, which necessitates alternative methods of obtaining BP measurements.

Office measurements correlate poorly with BP measured in other settings; can be supplemented by self-measured readings taken with validated home BP devices.

- Temperature (T) [2]
  - Glass mercury thermometers
    - Associated with adverse events (rectal/oral trauma, mercury exposure).
    - Require up to 7 minutes for accuracy.
  - Axillary temperatures by any method have great variation and a “norm” cannot be found.
  - Position all oral thermometers in left or right sublingual pocket.
  - Breathing patterns do NOT influence accuracy.
  - Hot & cold fluids DO influence accuracy.
  - Tympanic thermometers
    - Extremes in environmental temperatures & localized heating/cooling measures may affect tympanic temps.
    - Ear tug in adult & pediatric patients positively affects accuracy.
    - Impacted cerumen adversely influences accuracy.

- Pulse Oximetry (O2 sat) [2]
  - Should be considered a vital sign in situations where accurate patient assessment & monitoring is critical.
References


**Appendix A**

Quality of the Evidence

<table>
<thead>
<tr>
<th>Key Web Search Terms (2000 – 2007)</th>
<th>Joanna Briggs Institute</th>
<th>Ovid</th>
<th>CINAHL</th>
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Additional relevant articles & materials located through context links: 1

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