

Interprofessional clinical application of vital signs assessment for early detection of patient deterioration and coordinated decision making-An Updated Review for Healthcare Professionals

Fahad Abdulaziz Aljohani¹, Fayez Khalaf Alanazi², Yousef Ali Abdullah Alharbi³, Turki Jazi Alharby⁴, Sultan Safaha Alharbi⁵, Meshal Abdullah Alharbi⁶, Abdullah Sabih Alanazi⁷, Alsubhi Yousef Salman M⁸, Abdullaziz Fahad Abdullah Alwanais⁹, Abdullah Zayed Alrashidi¹⁰, Al Dosari Ibrahim Saad¹¹, Meshari saud alharthi¹²

Abstract

Background: Vital signs represent essential physiological indicators that provide objective insight into patient status and form the foundation of initial clinical assessment. They guide triage decisions, support early recognition of deterioration, and influence outcomes across healthcare settings. Despite their simplicity, vital signs carry strong diagnostic and prognostic value when correctly measured and interpreted. Their variability across populations and clinical environments highlights the need for standardized assessment and interprofessional coordination. **Aim:** This review aims to examine the interprofessional clinical application of vital signs in early detection of patient deterioration and to evaluate their role in coordinated clinical decision-making across healthcare settings. **Methods:** A narrative updated review approach was used to synthesize existing literature on vital sign assessment, interpretation, and clinical integration. Evidence from clinical studies, physiological principles, and healthcare practice guidelines was analyzed to explore measurement accuracy, predictive value, and interprofessional roles in monitoring systems such as early warning scores. **Results:** Findings demonstrate that vital signs remain central to early detection of clinical deterioration, particularly through parameters such as respiratory rate, blood pressure, temperature, and pulse rate. Respiratory rate showed strong predictive value for adverse outcomes, while early warning scores improved risk stratification within 48 hours of assessment. However, significant limitations exist due to measurement variability, especially in respiratory rate and blood pressure. **Conclusion:** Vital signs remain indispensable in clinical practice, yet their effectiveness depends on accurate measurement, standardized procedures, and interprofessional communication. Early warning systems enhance detection of deterioration, but their reliability relies on proper data collection and interpretation. Strengthening clinical training and team-based approaches improves patient outcomes and reduces preventable adverse events.

¹D Hospital in Jeddah, National Guard Health Affairs

²King Abdulaziz Medical City in Riyadh, National Guard Health Affairs

³Field Military Medicine, National Guard Health Affairs

⁴Field Military Medicine, Riyadh, National Guard Health Affairs

⁵Field Military Medicine, National Guard Health Affairs

⁶Field Military Medicine, Riyadh, National Guard Health Affairs

⁷Health Affairs, Riyadh

⁸Field Military Medicine, Riyadh, National Guard Health Affairs

⁹Field Military Medicine, Riyadh, National Guard Health Affairs

¹⁰Hospital, Riyadh, National Guard / Field Military Medicine

¹¹Field Medicine, National Guard Health Affairs

¹²National Guard Health Affairs

Keywords: Vital signs, interprofessional care, early warning scores, patient deterioration, clinical assessment, respiratory rate, patient safety, healthcare coordination

Introduction:

Vital signs represent fundamental quantitative indicators of essential physiological activity within the human body. They are designated as “vital” because they constitute the primary and most critical component of initial clinical assessment, forming the basis upon which subsequent diagnostic reasoning and clinical decision-making are established. The assessment of vital signs is routinely the first step in patient evaluation across all healthcare settings, as it provides immediate insight into the patient’s physiological stability and overall clinical status. In emergency and urgent care environments, triage decisions are predominantly guided by vital sign measurements, which assist clinicians in determining the severity of physiological disturbance relative to normal baseline values. Accurate interpretation of these physiological parameters requires healthcare professionals to possess a comprehensive understanding of both normal physiological regulation and pathological deviations that may influence these measurements. Reliance on clinical judgment without objective vital sign evaluation may result in misclassification of patient acuity and may fail to reflect the true urgency of clinical presentation [1]. Furthermore, abnormalities in vital signs have been associated with prognostic implications, including long-term health outcomes, rates of emergency department revisits, hospital readmissions, and overall healthcare resource utilization.

Conventionally, vital signs comprise core physiological measurements including body temperature, heart rate, blood pressure, and respiratory rate. Although additional physiological indicators have been proposed to complement these traditional parameters, evidence suggests that only pulse oximetry and smoking status demonstrate consistent relevance in predicting patient outcomes [2]. Pulse oximetry provides valuable supplementary information regarding oxygen saturation and respiratory efficiency, thereby enhancing clinical interpretation in cases where traditional vital signs alone may not fully reflect underlying physiological compromise. Smoking status has also been incorporated in certain clinical assessment frameworks due to its established role as a modifiable risk factor, with the additional clinical intention of prompting healthcare providers to initiate smoking cessation counseling as part of preventive care strategies. Historically, some healthcare systems, particularly within the United States, expanded the concept of vital signs to include pain as the “fifth vital sign.” However, this approach has since been critically reassessed and largely discontinued due to its unintended contribution to increased opioid prescribing practices and the subsequent escalation of the opioid crisis [3]. This evolution reflects a broader shift toward evidence-based refinement of clinical assessment tools, emphasizing the importance of balancing comprehensive patient evaluation with patient safety and responsible clinical practice.

Issues of Concern

Patient safety constitutes a central priority across all healthcare systems, and timely recognition of clinical deterioration remains a critical determinant of patient outcomes in both emergency departments and inpatient hospital wards. Early identification of subtle or progressive changes in vital signs is closely associated with prompt detection of cardiopulmonary instability, enabling clinicians to escalate care appropriately and initiate timely interventions. Such escalation may include increased monitoring frequency, transfer to higher levels of care, or activation of rapid response systems. Despite advances in monitoring technology and the widespread adoption of electronic devices for vital sign measurement, challenges persist in ensuring accuracy and consistency, particularly outside intensive care settings. One of the most significant limitations identified in clinical practice relates to the assessment of respiratory rate, which is often measured through manual observation. This method has been shown to produce subjective, inconsistent, and unreliable results, thereby reducing its clinical utility in early detection of patient deterioration [4]. Evidence from clinical research further highlights the prognostic value of specific vital sign abnormalities in predicting adverse outcomes. In a case-control study conducted by Rothschild and colleagues focusing on patients admitted to medical wards, a markedly elevated respiratory rate exceeding 35 breaths per minute demonstrated a strong association with life-threatening clinical

events, with an odds ratio of 31.1 [5]. This finding underscores the importance of respiratory rate as a highly sensitive indicator of acute physiological compromise, particularly in the context of early warning systems designed to identify at-risk patients before critical deterioration occurs. Early warning score (EWS) systems, which integrate multiple vital sign parameters into a composite risk score, have been developed to enhance clinical decision-making and improve patient surveillance. These scoring systems have been shown to be effective in predicting serious outcomes such as cardiac arrest and mortality within 48 hours of assessment, although their broader impact on long-term inpatient outcomes and healthcare resource utilization remains insufficiently defined [5].

The frequency and consistency of vital sign monitoring are widely considered essential factors in the early recognition of clinical decline. It is generally assumed that more frequent measurements increase the likelihood of detecting deterioration at an earlier stage, thereby improving the opportunity for timely intervention. However, in practice, the frequency of vital sign assessment varies considerably across healthcare institutions and between different countries. This variability is influenced by multiple factors, including the severity of patient illness, the presence of ongoing therapeutic interventions, staffing levels, resource availability, financial constraints, institutional protocols, and organizational leadership practices. Such inconsistencies may contribute to delays in recognizing patient deterioration and may affect overall patient safety outcomes. To address these challenges, many healthcare systems utilize weighted early warning scores derived from aggregated vital sign measurements to guide clinical decision-making regarding observation intervals. These scoring systems assist healthcare providers in determining when repeat assessments are necessary and when escalation of care should occur [4][5]. While these tools provide a structured approach to monitoring, their effectiveness depends heavily on accurate data collection, adherence to protocols, and appropriate clinical interpretation.

Clinical Significance

Body temperature represents a dynamic physiological parameter characterized by complex, nonlinear variability influenced by a wide range of intrinsic and extrinsic determinants. In healthy adults, the mean core body temperature is commonly cited as approximately 37.0°C or 98.6°F, although physiological variation is well recognized within a normal range typically spanning 36.5°C to 37.5°C (97.7°F to 99.5°F) [6]. Thermoregulation is centrally governed by the hypothalamus, which maintains temperature within a tightly controlled homeostatic range. This precise regulation is essential for optimizing enzymatic activity, metabolic processes, and synaptic transmission, all of which are highly sensitive to thermal fluctuations [7]. Even minor deviations from this regulated range may influence biochemical efficiency and cellular function, underscoring the clinical importance of accurate temperature assessment. In clinical practice, temperature measurement plays a pivotal role in diagnostic reasoning and therapeutic decision-making, particularly in pediatric populations where it often serves as a primary indicator of infectious or inflammatory processes. Clinical management decisions are frequently based on temperature values alone, especially in early assessment contexts where additional diagnostic data may not yet be available. Consequently, inaccuracies in temperature measurement, whether due to overestimation or underestimation, may lead to inappropriate clinical decisions, including unnecessary interventions or failure to identify serious febrile illness. The historical development of thermometry dates back to the sixteenth century with early conceptual contributions attributed to Galileo, while significant advancements occurred in 1709 when Daniel Fahrenheit developed both alcohol-based and mercury-based thermometric instruments, establishing a foundation for modern temperature measurement techniques [8].

Modern clinical practice employs multiple anatomical sites for temperature assessment, including oral, axillary, rectal, and tympanic locations. These measurements are typically obtained using electronic or infrared thermometers, which allow for rapid and repeated assessment across different clinical environments. Each measurement site possesses distinct physiological characteristics, advantages, and limitations that must be carefully understood by healthcare professionals to ensure accurate interpretation of results. Oral temperature measurement remains one of the most widely

used methods due to its convenience and relative reliability. In this method, the thermometer is positioned beneath the tongue, with particular emphasis on placement within the posterior sublingual pocket, which provides the most accurate representation of core temperature. However, accuracy may be affected by patient factors such as recent oral intake, breathing patterns, or improper placement. Tympanic temperature measurement, obtained via the external auditory canal, offers the advantage of rapid assessment and patient comfort. Similarly, axillary temperature measurement, performed by placing the thermometer in the axilla with the arm adducted, is non-invasive and easy to perform, particularly in pediatric settings. Nevertheless, both tympanic and axillary methods are generally considered less accurate compared with core temperature measurements and are therefore associated with reduced reliability in certain clinical contexts [8]. These limitations necessitate careful interpretation, particularly when clinical decisions depend on precise thermal assessment.

Rectal temperature measurement is widely regarded as the most accurate non-invasive approximation of core body temperature. This method involves insertion of a lubricated thermometer into the rectum and provides highly reliable internal temperature readings. Despite its clinical accuracy, it is often considered invasive and uncomfortable for patients, which limits its routine use in some settings. Gut temperature measurement using ingestible electronic capsules has also been developed and demonstrates values closely correlated with rectal temperature, offering an alternative approach for internal thermal monitoring in specific clinical scenarios. Beyond anatomical measurement sites, body temperature is also influenced by temporal physiological rhythms. Circadian variation significantly affects temperature values throughout the day, typically producing lower readings in the early morning and higher readings in the late afternoon or evening. Failure to account for these normal diurnal fluctuations may lead to misinterpretation of physiological temperature changes as pathological fever or hypothermia. In addition to circadian rhythm, females exhibit cyclical variations in body temperature associated with hormonal fluctuations during the menstrual cycle, commonly referred to as the circamensal rhythm. This physiological pattern is clinically relevant in fertility assessment and is often utilized in identifying ovulatory phases for individuals attempting conception.

Age and physical fitness further contribute to variability in thermoregulatory responses. Evidence suggests that younger individuals and those with higher levels of physical fitness tend to exhibit greater amplitude in daily temperature fluctuations, whereas older adults and individuals with lower fitness levels demonstrate more attenuated thermal variability [9]. These differences reflect age-related changes in metabolic activity, vascular responsiveness, and thermoregulatory efficiency. Additionally, emerging research has proposed the possibility of seasonal variations in body temperature; however, current evidence remains inconclusive, and further investigation is required to establish definitive relationships [9]. Overall, the clinical significance of temperature measurement extends beyond simple fever detection and encompasses a complex interplay of physiological regulation, methodological variation, and temporal influences. Accurate interpretation requires a comprehensive understanding of measurement techniques, biological variability, and contextual factors that influence temperature readings. This ensures that clinical decisions are based on reliable physiological interpretation, thereby improving diagnostic accuracy and patient care outcomes.

Pulse Rate

Pulse rate represents a fundamental clinical parameter reflecting the mechanical activity of the heart transmitted through arterial walls. It provides essential information about cardiovascular function, hemodynamic stability, and systemic physiological status. Clinical assessment of pulse is routinely performed at multiple anatomical sites depending on accessibility and clinical context. Common peripheral pulse sites include the radial, ulnar, and brachial arteries in the upper limb, as well as the posterior tibial and dorsalis pedis arteries in the lower limb. The femoral pulse is also frequently assessed in more central circulation evaluation. In addition, the carotid pulse in the neck is commonly examined, particularly in situations requiring rapid assessment of central perfusion. Among these, the radial pulse remains the most widely utilized site in routine clinical practice due

to its accessibility, ease of palpation, and patient comfort. It is typically assessed on the radial aspect of the forearm, just proximal to the wrist joint, where arterial pulsations are most prominent. Comprehensive pulse evaluation extends beyond simple measurement of heart rate and includes multiple qualitative and quantitative parameters such as rhythm, volume, amplitude, rate of rise, and symmetry. Pulse rate is a critical determinant in assessing physiological and pathological states affecting cardiovascular function. In adults, the normal resting pulse rate ranges between 60 and 100 beats per minute. Values exceeding 100 beats per minute are classified as tachycardia, whereas values below 60 beats per minute are defined as bradycardia. Both deviations may reflect underlying systemic, cardiac, or metabolic disturbances. In pediatric populations, heart rate varies significantly with age, and age-specific reference ranges are essential for accurate interpretation, as outlined in standard clinical tables.

Evaluation of pulse rhythm is a key component of cardiovascular assessment. Pulse rhythm may be categorized as regular, irregular, or irregularly irregular. A regular rhythm indicates consistent cardiac electrical activity, while irregular rhythms may suggest underlying arrhythmias or conduction abnormalities. A physiological variation known as sinus arrhythmia is characterized by cyclic changes in heart rate associated with respiration, where the pulse accelerates during inspiration and decelerates during expiration. In contrast, an irregularly irregular rhythm is more commonly associated with pathological conditions such as atrial fibrillation or atrial flutter, which reflect disorganized atrial electrical activity and impaired cardiac output. Simultaneous palpation of radial and femoral pulses is an important clinical maneuver for assessing vascular integrity and detecting potential circulatory abnormalities. A delay between these pulses may indicate structural vascular disorders such as coarctation of the aorta, which results in impaired distal perfusion due to narrowing of the aortic lumen. Pulse volume, which refers to the strength of arterial pulsation, provides indirect information about stroke volume and peripheral perfusion status. A weak or low-volume pulse may suggest reduced cardiac output or hypovolemia and can serve as an indirect indicator of systolic blood pressure. Clinically, the presence of a palpable radial pulse generally correlates with a systolic blood pressure above 80 mmHg, while femoral pulse palpation suggests a systolic pressure above 70 mmHg, and carotid pulse detection indicates a systolic pressure exceeding 60 mmHg [10]. Assessment of pulse symmetry is also clinically significant, as asymmetrical pulses may indicate localized or systemic vascular pathology. Conditions such as aortic dissection, aortic coarctation, Takayasu arteritis, and subclavian steal syndrome can produce unequal pulse amplitudes between corresponding limbs. These findings are important diagnostic indicators that may necessitate further vascular imaging and evaluation [10].

In addition to rhythm and volume, pulse amplitude and rate of rise provide further diagnostic insight into cardiovascular function. A slow rising and low-amplitude pulse may be indicative of conditions such as aortic stenosis, where outflow obstruction reduces the velocity and strength of arterial pulsations. Similarly, low-volume pulses are often associated with states of poor peripheral perfusion. Conversely, a rapid rising and high-amplitude pulse may be observed in conditions characterized by increased stroke volume or decreased peripheral resistance, such as aortic regurgitation, mitral regurgitation, and hypertrophic cardiomyopathy. These pulse characteristics reflect altered hemodynamic states and are valuable in guiding clinical suspicion and further diagnostic investigation. Overall, pulse rate assessment remains a cornerstone of clinical examination, offering critical insights into cardiovascular performance and systemic physiological conditions. Accurate interpretation requires integration of multiple pulse characteristics rather than reliance on rate alone, ensuring comprehensive evaluation of patient status and supporting early identification of potentially life-threatening conditions [10].

Respiratory Rate

Respiratory rate is a fundamental vital sign that reflects the number of complete respiratory cycles occurring within one minute. It serves as a critical indicator of pulmonary function, ventilatory efficiency, and overall physiological stability. In healthy adults, the normal respiratory rate typically ranges between 12 and 20 breaths per minute, although variations may occur depending on

physiological demand and clinical context. In pediatric populations, respiratory rate is highly age-dependent, with younger age groups exhibiting significantly higher baseline values that gradually decrease with maturation. Accurate assessment of respiratory rate requires careful evaluation not only of frequency but also of depth and pattern of breathing, as these components collectively provide important diagnostic information regarding respiratory and systemic conditions. Alterations in respiratory rate are clinically categorized as tachypnea and bradypnea. Tachypnea refers to an increased respiratory rate exceeding 20 breaths per minute in adults. While tachypnea may occur as a normal physiological response to increased metabolic demand, such as during physical exercise, emotional stress, or pregnancy, it is also frequently associated with a wide range of pathological conditions. These include pain, pneumonia, pulmonary embolism, bronchial asthma, foreign body aspiration, anxiety disorders, systemic infection such as sepsis, carbon monoxide poisoning, and metabolic disturbances such as diabetic ketoacidosis. In these conditions, tachypnea often reflects compensatory mechanisms aimed at improving oxygenation or eliminating excess carbon dioxide, thereby maintaining acid-base homeostasis [9][10][11].

Bradypnea, defined as a respiratory rate below 12 breaths per minute, indicates abnormally reduced ventilation and may signal significant underlying pathology. It is commonly associated with central nervous system depression due to substances such as alcohol, opioids, benzodiazepines, and other sedative agents. Additionally, bradypnea may occur in severe respiratory compromise, where ventilatory drive is impaired due to advanced pulmonary disease or impending respiratory failure. Metabolic derangements may also contribute to reduced respiratory rates by altering central respiratory control mechanisms. In extreme cases, complete cessation of breathing, known as apnea, may occur. Apnea is characterized by a pause in airflow lasting approximately 15 seconds or longer and is commonly observed in cardiopulmonary arrest, airway obstruction, and severe drug overdoses involving narcotics or sedative-hypnotic agents. Beyond respiratory rate, the depth of ventilation is a crucial parameter in clinical assessment. Hyperpnea refers to an increase in the depth of breathing, which may occur as a physiological response during exercise or emotional stress. It may also be observed in pathological states such as pulmonary infections and congestive heart failure, where increased ventilatory effort is required to meet metabolic demands or compensate for impaired gas exchange. Hyperventilation, in contrast, is characterized by both increased rate and depth of breathing, leading to excessive elimination of carbon dioxide. While it may occur in benign conditions such as anxiety or physical exertion, it is also a hallmark of serious metabolic disorders including diabetic ketoacidosis and lactic acidosis, where it serves as a compensatory mechanism to correct metabolic acidosis. Hypoventilation describes a reduction in both the rate and depth of breathing, resulting in inadequate alveolar ventilation and potential carbon dioxide retention. This condition may arise from central nervous system depression due to sedative medications, severe metabolic alkalosis, or specific clinical conditions such as obesity hypoventilation syndrome. Hypoventilation can lead to progressive respiratory acidosis and, if untreated, may contribute to respiratory failure and systemic decompensation [11].

The pattern of respiration provides further diagnostic insight into underlying neurological, metabolic, and cardiopulmonary disorders. Biot respiration is characterized by irregular breathing patterns consisting of variable cycles of rapid, deep respirations followed by periods of apnea. This pattern is commonly associated with elevated intracranial pressure and may be observed in conditions such as intracranial space-occupying lesions or central nervous system infections like meningitis. Cheyne-Stokes respiration presents as a cyclic pattern of gradually increasing depth of breathing followed by progressive reduction and subsequent apnea. This pattern is frequently associated with congestive heart failure, increased intracranial pressure, and sedative overdose, reflecting instability in respiratory control mechanisms. Kussmaul respiration is defined by deep, labored, and regular breathing, typically occurring without significant variation in respiratory rate. It is classically associated with severe metabolic acidosis, particularly diabetic ketoacidosis and chronic renal failure, where it serves as a compensatory mechanism to reduce acid load by enhancing carbon dioxide elimination. Orthopnea refers to dyspnea that occurs in the supine position and is relieved by sitting or standing. This symptom is commonly observed in congestive

heart failure due to redistribution of fluid and increased pulmonary congestion when lying flat. Paradoxical respiration represents an abnormal breathing pattern in which there is inward movement of the abdominal or thoracic wall during inspiration and outward movement during expiration. This dysfunctional pattern is typically associated with diaphragmatic paralysis, severe respiratory muscle fatigue, or traumatic injury to the chest wall. It reflects impaired coordination of respiratory mechanics and may indicate significant respiratory compromise requiring urgent clinical evaluation. Overall, respiratory rate and its associated parameters provide essential diagnostic and prognostic information in clinical practice. Careful assessment of rate, depth, and pattern of breathing enables early detection of respiratory dysfunction and systemic disease, supporting timely intervention and improved patient outcomes [10][11].

Blood Pressure

Blood pressure represents a core physiological parameter that reflects the interaction between cardiac output and systemic vascular resistance. Its measurement provides essential insight into cardiovascular stability, tissue perfusion, and overall hemodynamic status. In clinical practice, blood pressure is not merely a numerical value but a dynamic indicator that influences diagnostic reasoning, risk stratification, and immediate therapeutic decisions across acute and chronic care settings. Despite its central role in patient assessment, blood pressure measurement remains highly susceptible to methodological variation and operator-related inaccuracies, which can significantly alter clinical interpretation and lead to inappropriate management decisions. Accurate measurement requires strict adherence to standardized pre-assessment conditions. Failure to control these variables may produce falsely elevated or falsely reduced readings that do not reflect the patient's true physiological state. Caffeine intake within one hour prior to measurement can transiently increase sympathetic activity, resulting in elevated systolic and diastolic values. Similarly, nicotine exposure within the preceding 15 minutes induces peripheral vasoconstriction and increases arterial pressure. A full urinary bladder is another important confounder, capable of increasing blood pressure readings by approximately 10 mmHg due to sympathetic stimulation and discomfort-related stress responses. These physiological influences highlight the necessity of structured preparation before any clinical measurement is performed [11].

Comparison of BP target Recommendations		SBP (mm Hg)	DBP (mmHg)
JNC 7,2003	<140/90 mm Hg <130/80 mm Hg for those with Diabetes of CKD	Normal < 120 Prehypertension 120-139 Stage 1 140-159 Hypertension >160 Stage 2 Hypertension	<80 80-89 90-99 ➤ 100
JNC 8,2014	< 150/90 mm Hg for patients ≥ 60 < 140/90 mm Hg for patients < 60, diabetes, and chronic kidney disease		
ACP/AAFP,2017	< 150/90 mm Hg for patients ≥ 60 < 140/90 mm Hg for patients at higher CV risk, or with a history of stroke or TIA		
ACC/AHA,2017	≤ 130/80 mm Hg	Normal < 120 Stage 1 hypertension 130–139 Stage 2 hypertension ≥ 140	< 80 Elevated 80–89 Stage 1 hypertension 120–129 Stage 2 hypertension ≥ 90

Figure-1: Blood Pressure Targets.

Patient positioning and environmental conditions also play a critical role in ensuring reliability. A minimum rest period of five minutes in a seated position is recommended prior to measurement to stabilize cardiovascular parameters and reduce the influence of physical activity or emotional stress associated with clinical attendance. Conversation during measurement introduces additional variability, as speaking or active listening has been shown to increase readings by approximately 10 mmHg through sympathetic activation. The patient's posture must be standardized, with the back supported, feet flat on the floor, and legs uncrossed. Unsupported posture can elevate readings by approximately 6 mmHg, while leg crossing may increase systolic values by 2 to 4 mmHg due to changes in vascular resistance and venous return. These seemingly minor factors collectively contribute to clinically significant deviations in measurement accuracy. Proper limb positioning is equally essential. The arm used for measurement should be fully supported and maintained at the level of the heart. When the arm is left unsupported, hydrostatic pressure changes may lead to falsely elevated readings of approximately 10 mmHg. This reinforces the importance of standardized technique to ensure reproducibility and validity of results across repeated measurements and different healthcare providers. Cuff selection is another critical determinant of measurement accuracy. The cuff size must be appropriately matched to the patient's arm circumference. A cuff that is too small relative to the arm size can result in artificially elevated blood pressure readings due to excessive compression required to occlude arterial flow. Conversely, a cuff that is too large may underestimate true blood pressure values because of insufficient arterial compression. This technical aspect is often overlooked in routine practice, yet it represents a major source of diagnostic error in hypertension assessment and monitoring [11].

Blood pressure should ideally be measured in both arms during initial assessment to identify inter-arm differences, which may indicate underlying vascular pathology. In younger patients, additional measurements in both upper and lower extremities are recommended to screen for conditions such as coarctation of the aorta. Significant discrepancies between limb readings can provide early diagnostic clues to structural or obstructive vascular disease, emphasizing the importance of comprehensive assessment rather than isolated measurement. Overall, blood pressure measurement requires a structured and standardized approach that integrates patient preparation, correct positioning, appropriate equipment selection, and bilateral assessment. When these principles are not followed, the risk of misclassification of hypertension or hypotension increases substantially, potentially leading to inappropriate clinical decisions. Accurate blood pressure assessment therefore remains a fundamental clinical skill that directly influences patient safety, treatment outcomes, and long-term cardiovascular risk management [11].

Interprofessional Team Interventions

Variability of Vital Signs in the Geriatric Age Group

Vital signs in older adults demonstrate distinct physiological variability driven by age-related structural and functional changes across multiple organ systems. These variations require a coordinated interprofessional approach to ensure accurate interpretation, timely detection of deterioration, and appropriate clinical intervention. Aging modifies baseline physiological parameters, which complicates the identification of abnormal findings and increases the risk of under-recognition of critical illness if age-adjusted interpretation is not applied. Core body temperature tends to decline with advancing age due to reduced metabolic rate and altered thermoregulatory mechanisms. In older adults, even minimal deviations from baseline temperature may represent clinically significant pathology. Fever in this population is not always pronounced despite severe infection, and in many cases, it may be blunted or absent. This atypical presentation is associated with delayed diagnosis and increased risk of adverse outcomes, including sepsis and mortality [12]. Interprofessional teams, including nurses, physicians, and allied health professionals, must maintain a high index of suspicion when subtle changes in temperature occur, even in the absence of overt febrile response. Respiratory physiology also undergoes significant age-related changes. There is a progressive decline in respiratory muscle strength, decreased chest wall compliance, and reduced elastic recoil of lung tissue. These anatomical and functional

alterations lead to diminished responsiveness to hypoxia and hypercapnia at the cellular level. As a result, respiratory rate becomes a more sensitive indicator of clinical deterioration compared to other vital signs. Despite this, respiratory rate is frequently under-assessed or inaccurately recorded in hospitalized patients, limiting its clinical utility in early warning systems [13]. Effective interprofessional collaboration is essential to ensure accurate measurement, consistent documentation, and appropriate escalation when abnormalities are detected.

Cardiovascular changes are equally significant in the geriatric population. Aging is associated with increased arterial stiffness, endothelial dysfunction, and reduced vascular compliance. These changes contribute to elevated systolic blood pressure and widened pulse pressure, even in the absence of overt cardiovascular disease. Orthostatic hypotension is another common phenomenon resulting from impaired autonomic regulation and reduced baroreceptor sensitivity. This condition is often exacerbated by polypharmacy, dehydration, and inadequate fluid intake. Consequently, orthostatic vital sign assessment becomes a critical component of geriatric evaluation to prevent falls, syncope, and associated complications [14]. Resting heart rate may also increase due to deconditioning and autonomic imbalance, further complicating clinical interpretation. Given these complexities, interprofessional team interventions are essential for optimizing patient outcomes. Nurses play a central role in continuous monitoring and early identification of subtle physiological changes. Physicians are responsible for integrating these findings into diagnostic and therapeutic decision-making. Pharmacists contribute by reviewing medication regimens that may influence hemodynamic stability or autonomic function. Allied health professionals, including physiotherapists and occupational therapists, support functional assessment and mobility optimization, which indirectly influence vital sign stability.

Limitations of Vital Signs

Despite their fundamental role in clinical assessment, vital signs are subject to significant limitations, particularly related to measurement accuracy and inter-observer variability. The acquisition of reliable vital sign data requires standardized technique, adequate training, and consistent application of measurement protocols. Variability in technique among healthcare providers can lead to inconsistent readings, which may affect clinical decisions and patient outcomes. Inter-observer variability remains a persistent issue, particularly in the measurement of parameters such as respiratory rate and blood pressure, which are prone to subjective estimation or improper technique. Inadequate training, time constraints, and workload pressures further contribute to measurement errors. These inaccuracies can result in either overestimation or underestimation of patient acuity, potentially delaying necessary interventions or prompting unnecessary treatments. To address these limitations, healthcare organizations must implement continuous education and competency-based training programs for all clinical staff involved in vital sign assessment. Regular auditing and quality assurance processes are necessary to ensure adherence to standardized measurement protocols. In situations where unexpected or clinically significant changes in vital signs are observed, clinicians should independently verify measurements rather than relying solely on recorded data. An interprofessional culture of accountability is essential to strengthen the reliability of vital sign monitoring systems. By reinforcing proper technique, encouraging cross-verification of abnormal findings, and promoting collaborative decision-making, healthcare teams can reduce errors and improve early detection of clinical deterioration. This approach ultimately enhances patient safety, improves clinical outcomes, and supports more effective utilization of healthcare resources across diverse clinical settings [14].

Conclusion:

Vital signs remain one of the most reliable tools for initial and continuous patient assessment across all healthcare settings. They provide immediate physiological information that supports early clinical decisions and helps identify deterioration before irreversible outcomes occur. When accurately measured and properly interpreted, they contribute directly to improved patient safety

and better clinical outcomes. Evidence shows that no single vital sign is sufficient alone. Respiratory rate, temperature, pulse rate, and blood pressure must be evaluated together to form a complete clinical picture. Respiratory rate stands out as a strong early indicator of deterioration, while blood pressure and pulse provide key hemodynamic insights. Temperature changes add important diagnostic value, especially in infection and inflammatory conditions. Clinical practice still faces challenges in measurement accuracy and consistency. Errors in technique, poor documentation, and inter-observer variability reduce the reliability of vital sign data. These issues become more significant in complex cases and in high-risk populations such as older adults, where physiological changes mask typical clinical signs. Interprofessional collaboration improves the quality of vital sign monitoring. Nurses, physicians, pharmacists, and allied health professionals each contribute to accurate assessment, interpretation, and response. Early warning systems strengthen this process by standardizing risk identification and supporting timely escalation of care. Improving outcomes depends on consistent training, adherence to standardized protocols, and stronger communication between healthcare teams. Accurate vital sign assessment remains a practical and essential step in reducing preventable deterioration and enhancing overall healthcare delivery.

References:

1. Cooper RJ, Schriger DL, Flaherty HL, Lin EJ, Hubbell KA. Effect of vital signs on triage decisions. *Ann Emerg Med.* 2002 Mar;39(3):223-32.
2. Lockwood C, Conroy-Hiller T, Page T. Vital signs. *JBI Libr Syst Rev.* 2004;2(6):1-38.
3. Levy N, Sturgess J, Mills P. "Pain as the fifth vital sign" and dependence on the "numerical pain scale" is being abandoned in the US: Why? *Br J Anaesth.* 2018 Mar;120(3):435-438.
4. Smith GB, Prytherch DR, Jarvis S, Kovacs C, Meredith P, Schmidt PE, Briggs J. A Comparison of the Ability of the Physiologic Components of Medical Emergency Team Criteria and the U.K. National Early Warning Score to Discriminate Patients at Risk of a Range of Adverse Clinical Outcomes. *Crit Care Med.* 2016 Dec;44(12):2171-2181.
5. Rothschild JM, Gandara E, Woolf S, Williams DH, Bates DW. Single-parameter early warning criteria to predict life-threatening adverse events. *J Patient Saf.* 2010 Jun;6(2):97-101.
6. Hutchison JS, Ward RE, Lacroix J, Hébert PC, Barnes MA, Bohn DJ, Dirks PB, Doucette S, Fergusson D, Gottesman R, Joffe AR, Kirpalani HM, Meyer PG, Morris KP, Moher D, Singh RN, Skippen PW., Hypothermia Pediatric Head Injury Trial Investigators and the Canadian Critical Care Trials Group. Hypothermia therapy after traumatic brain injury in children. *N Engl J Med.* 2008 Jun 05;358(23):2447-56.
7. Johansson A. Core Temperature-The Intraoperative Difference Between Esophageal Versus Nasopharyngeal Temperatures and the Impact of Prewarming, Age, and Weight. *AANA J.* 2019 Feb;87(1):6.
8. Minzola DJ, Keele R. Relationship of Tympanic and Temporal Temperature Modalities to Core Temperature in Pediatric Surgical Patients. *AANA J.* 2018 Feb;86(1):19-26.
9. Kelly G. Body temperature variability (Part 1): a review of the history of body temperature and its variability due to site selection, biological rhythms, fitness, and aging. *Altern Med Rev.* 2006 Dec;11(4):278-93.
10. Deakin CD, Low JL. Accuracy of the advanced trauma life support guidelines for predicting systolic blood pressure using carotid, femoral, and radial pulses: observational study. *BMJ.* 2000 Sep 16;321(7262):673-4.
11. Muntner P, Shimbo D, Carey RM, Charleston JB, Gaillard T, Misra S, Myers MG, Ogedegbe G, Schwartz JE, Townsend RR, Urbina EM, Viera AJ, White WB, Wright JT. Measurement of Blood Pressure in Humans: A Scientific Statement From the American Heart Association. *Hypertension.* 2019 May;73(5):e35-e66.

12. Chester JG, Rudolph JL. Vital signs in older patients: age-related changes. *J Am Med Dir Assoc.* 2011 Jun;12(5):337-43.
13. Subbe CP, Davies RG, Williams E, Rutherford P, Gemmell L. Effect of introducing the Modified Early Warning score on clinical outcomes, cardio-pulmonary arrests and intensive care utilisation in acute medical admissions. *Anaesthesia.* 2003 Aug;58(8):797-802.
14. Coupé M, Fortrat JO, Larina I, Gauquelin-Koch G, Gharib C, Custaud MA. Cardiovascular deconditioning: From autonomic nervous system to microvascular dysfunctions. *Respir Physiol Neurobiol.* 2009 Oct;169 Suppl 1:S10-2.