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Resilience, the 6th Vital Sign: Conceptualizing, Contextualizing, and Operationalizing All Six Vital Signs

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Abstract

There are five vital signs that healthcare providers assess: temperature, pulse, respiration, blood pressure, and pain. Normal levels for the five vital signs are published by the American Heart Association, and other specialty organizations, however, the sixth vital sign (resilience) which adopts the measure of immune resilience is suggested in this paper. Resilience is the ability of the immune system to respond to attacks and defend effectively against infections and inflammatory stressors, and psychological resilience is the capacity to resist, adapt, recover, thrive, and grow from a challenge or a stressor. Individuals with better optimal immune resilience had better health outcomes than those with minimal immune resilience. The purpose of this paper is to conceptualize, contextualize, and operationalize all six vital signs. We suggest measuring resilience subjectively and objectively. Subjectively, use a 5-item guided interview revised from the Connor-Davidson Resilience Scale (CDRC), a scale of 10 items. The revised CDRC scale is a 5-item scale. The scale is rated on a 5-point Likert scale from 0 (not true) to 4 (true all the time). The total score ranges from 0 to 20, with higher total scores indicating greater resilience. The scale demonstrated good construct validity and internal consistency (α = 0.85) during the development of the scale. The CD-RISC had a good Cronbach's alpha level of 0.85. The Revised CD-RISC can be completed in 2 - 4 minutes. To measure resilience objectively, we suggest using Immune Resilience (IR) levels, the level of resilience to preserve and/or rapidly restore immune resilience functions that promote disease resistance and control inflammation and other inflammatory stress. IR levels are gauged with two peripheral blood metrics that quantify the balance between CD8 and CD4 T-cell levels and gene expression signatures tracking longevity-associated immunocompetence and mortality- or entropy-associated inflammation. IR deregulation is potentially reversible by decreasing inflammatory stress. IR metrics and mechanisms have utility as vital signs and biomarkers for measuring immune health and improving health outcomes.

Keywords

Conceptualization, Contextualization, Operationalization, Body Temperature, Pulse, Respiration, Blood Pressure, Pain, Resilience

1. Introduction

1.1. Vital Signs

Vital signs are measurements of the body's most basic functions and provide an immediate assessment of health status used to assess a person's well-being and/or response to treatment. These basic measurements provide such valuable information about current and developing health status that they are part of every healthcare encounter and are often measured by individuals at home.

Currently, there are five vital signs routinely monitored: body temperature, pulse rate, respiratory rate, blood pressure, and pain [1]. In some healthcare systems, pain as a vital sign has been abandoned due to the opioid crisis that rocks the nation and the world, where the presence or absence of pain is too subjective [2] [3].

The authors propose that resilience should now be included as the sixth vital sign. Resilience represents the body's capacity to preserve and/or rapidly restore immune functions that promote disease resistance and control inflammation due to diseases or stress [4]. As such, it is a vital assessment that contributes to the overall assessment of a person's health status as well as their ability to adhere to and respond to treatment. Resilience is measured objectively via Immune Resilience (IR) levels and subjectively through though use of a five-question tool.

1.2. Background

The widening gap between lifespan (how old are you/) and healthspan (how many days were you in "good health" during the past week, month, or year) is enormous [5]-[7]. It is well known that resilience is linked to the ability to endure and recover from trauma. Moreover, the level of resilience contributes to one's healthspan and can be improved through interventions throughout the entire lifespan. Higher levels of resilience in a person indicate a greater ability to cope with challenges, stress, or illness; and yet, it is not assessed despite its value in developing health goals and treatment plans.

Resilience should be the sixth vital sign due to two significant aspects of population health. First, we know the widespread negative effect of trauma and adverse childhood events on health and wellness [8]. Routine assessment of resilience, and interventions to raise low levels of resilience, therefore, should be part of any treatment plan or long-term health goals. Second, it may not be feasible to screen or address past trauma when supporting the growing aging population. By assessing and supporting resiliency instead, the focus is positive and improves healthspan.

1.3. Aims

The purpose of this paper is to conceptualize, contextualize, and operationalize all known five vital signs and incorporate a new sixth vital sign, resilience. Conceptualization is the act or process of forming an idea or principle in the mind. It involves memorializing clear and concise definitions of key concepts.

Contextualization is the process of considering something in the situation within which it exists or happens, which can help in understanding it. One must know the context of a vital sign before determining its significance.

Operationalization means turning abstract concepts into contexts, and measurable observations. Although body temperature, pulse rate, respiration, and blood pressure are easily measured, others, like resilience, are not. Through operationalization, one can systematically collect data on processes and phenomena that are not directly observable and gauge the levels that quantify their balance in comparison to a known factor related to them.

2. Conceptualization of the Six Vital Signs

2.1. Body Temperature

Body temperature readings may reflect the core body temperature, the temperature of the internal organs, or the temperature of the body's surfaces, which change temperature due to environmental exposure [9]. The normal body temperature of a person varies depending on gender, recent activity, food, fluid consumption, time of day, and, in women, the stage of the menstrual cycle. Normal body temperature can range from 97.8 degrees Fahrenheit (F), equivalent to 36.5 degrees Celsius (C) to 99 degrees F (37.2 degrees ˚C) for a healthy adult. A person's body temperature can be taken in any of the following ways, orally, rectally, axillary, by ear, or by skin using a thermometer.

2.2. Pulse Rate

The pulse rate is a measurement of the heart rate or the number of times the heart beats per minute. As the heart pushes blood through the arteries, the arteries expand and contract with the flow of the blood. Taking a pulse not only measures the heart rate but also can indicate the heart rhythm and strength of the pulse. The normal range for pulse of healthy adults is 60 to 100 beats per minute. The pulse rate may fluctuate and increase with exercise, illness, injury, and emotions.

2.3. Respiration Rate

The respiration rate is the number of breaths a person takes per minute. The respiration rate is usually measured when a person is at rest. Counting the number of breaths for one minute by counting how many times the chest rises and falls is the respiration rate. Respiration rates may increase with fever, panic, stress, illness, and other health conditions. Normal respiration rates for an adult person at rest range from 12 to 16 breaths per minute [9].

2.4. Blood Pressure

Blood pressure is the force of the blood pushing against the artery walls during contraction and relaxation of the heart. Pumping blood into the arteries each time the heart beats results in the highest blood pressure as the heart contracts. When the heart relaxes, the blood pressure falls. Two numbers are recorded when measuring blood pressure. The higher number, or systolic pressure, is the pressure inside the artery when the heart contracts and pumps blood through the body. The lower number, or diastolic pressure, is the resting pressure inside the artery when the heart relaxes, filling with blood. Both the systolic and diastolic pressures are recorded as "mm Hg" (millimeters of mercury). This recording represents how high the mercury column in an old-fashioned manual blood pressure device (called a mercury manometer or sphygmomanometer) is raised by the pressure of the blood [9].

2.5. Pain

Pain is an unpleasant sensory and emotional experience arising from actual or potential tissue damage [10]. Pain assessment is critical to pain management and interventions. The absence of pain is a coveted state of personhood. Several aspects define pain and its effects: pain severity, chronicity, and pain experience. Pain severity contains pain-related interference with activities or disability, and the intensity of pain [11]. It is a universal experience that clients manifest when in certain pathological conditions. It is an integral part of the assessment to determine the appropriate management of clients. Two aspects of pain severity may form a bidimensional or a unidimensional scale depending on the specific instruments tested. High intercorrelations between pain-intensity measures and pain-related disability support the concept of using them as a unitary construct of pain severity [12]. Moreover, disability is a major indicator of the severity of a pain condition and several tools have been developed to assess pain-related disability [13].

2.6. Resilience

The conceptualization of resilience is complex because resilience has been a subject of study and inquiry by a myriad of theoreticians, and conceptualizers. and until recently a finding of immune resilience despite inflammatory stress promoting longevity and favorable health outcomes including resistance to infection [14]-[16]. Resilience encompasses the capacity to resist, adapt, recover, or bounce back from a challenge [17]. Resilience is the human regenerative capacity to resist, adapt, recover, or grow from a challenge [18]. It maintains health and function in the face of loss, trauma, disease, or bending without breaking. In resilience, the system's response to a challenge will fluctuate and show various degrees of responses depending on the severity and length of time of exposure to the challenge with innate psychobiological factors. If successful, it will transform failure into growth and challenges into opportunities; but resiliency is fungible and expendable. Studies show that the human attribute of resilience comes with positive adaptation as a marker [19]-[22].

The concept of resilience is found in theories of motivation, self-advocacy, and self-efficacy [23]. Resilience is considered an attribute that supports health outcomes for those who have been exposed to trauma, environmental hazards, or experiences of abuse [24] [25]. Resilience throughout the life course enhances the ability to recover from adversity, thrive with a sustained purpose, and grow in a world of change, trauma, and chronic illness [26]. Resilience allows individuals to adapt to the wear and tear of living while coping with problems and crises in ways that leave them feeling stronger and wiser than they would have been if they had not encountered those problems and improved healthspan [7]. Furthermore, resilience is seen as both an intervention process and an outcome, while others consider resilience a trait or inborn capability or as a more fluid attribute that comes into play as one equilibrates thinking, feeling, and behaving.

3. Contextualization of Vital Signs

3.1. Body Temperature

Body temperature may be abnormal due to fever (high temperature) or hypothermia (low temperature). A fever is present when body temperature rises about one degree or more over the normal temperature of 98.6 degrees Fahrenheit. Hypothermia is a drop in body temperature below 95 degrees. [1] It is important to compare body temperature readings to baseline values for an individual [9]. An abnormal temperature may indicate a pathology, such as infection. Monitoring the body temperature dynamically throughout treatment is important. Prolonged exposure to cold makes internal organs hypothermic needing to balance body temperature [9].

3.2. Pulse

The pulse rate normally varies throughout the day based on activity and rest. A prolonged increase or decrease in rate could indicate exercise, illness, injury, or emotions [1] [9]. Those who do a lot of cardiovascular conditioning, for example, may have rates below 60 and experience no problems [1]. In addition to rate, the pulse is assessed for regularity, strength, and symmetry. An abnormal rhythm could indicate a chronic condition, such as atrial fibrillation, or an acute adverse response to drugs.

3.3. Respiration Rate

Respiration rate is the number of breaths a person takes per minute. The rate is usually measured when a person is at rest and simply involves counting the number of breaths for one minute by counting how many times the chest rises. Normal respiration rates for an adult person at rest range from 12 to 16 breaths per minute [1]. Respiration allows the lungs to access oxygen and eliminate carbon dioxide [9]. Respiration rates may increase with fever, illness, and other medical conditions. While counting, one also assesses if the person exhibits any difficulty breathing as evidenced by posture, nasal flaring, pursed lips, or use of accessory muscles.

3.4. Blood Pressure

Blood pressure is the force of the blood pushing against the artery walls during contraction and relaxation of the heart. High blood pressure, or hypertension, directly increases the risk of heart attack, heart failure, and stroke. With high blood pressure, the arteries may have an increased resistance against the flow of blood, causing the heart to pump harder to circulate the blood. Severe hypertension requires additional assessment as causes may vary from age, pregnancy, or drug use, and treatment would be very different for each. Causes of severe hypotension range from heart failure, sepsis, or hemorrhage. Dynamic monitoring of blood pressure is vital to evaluate the effectiveness of any treatment plan.

3.5. Pain

It is recognized that psychological, psychosocial, and contextual [27] factors may influence pain perception. These factors have a powerful effect on the experience of pain itself. With this background, pain acceptance, pain tolerance, and pain-related anxiety as factors influencing coping strategies are discussed. Finally, a recommendation for a minimum as well as for a more comprehensive pain assessment is suggested by Pozza, Azevedo & Lopes [11].

3.6. Resilience

At the core of resilience are stress responses that are sufficient as well as efficient for recovery following stress [19]. Exposure to severe trauma, continuous stress, or illness diminishes one's resilience. Resilience activates healthy emotional regulation, reappraisal, and help-seeking behaviors [7] breaking the cycle of depletion. Studies have shown resilience and social support go hand and glove because positive emotions arise from belongingness and self-esteem. and help-seeking behaviors, ingredients of social properties of resilience, thus replenishing resilience, and social support and magnifying the practical effect of the intervention.

The potential impact of a resilience intervention in terms of an empirical basis is significant: Adequate resilience to master challenges; coping with stressors through positive emotions and help-seeking behaviors; acceptance of situations beyond one's control; capacity for cognitive reappraisal; and healthy emotional regulation. Resilience, therefore, is both an intervention and an outcome, though some consider resilience a trait or inborn capability, and others a more fluid attribute that comes into play as one equilibrates thinking, feeling, and behaving [28].

Hoare [18] suggested that the human attribute of resilience comes with positive adaptation as a marker. The construct of resilience is found in theories of motivation, self-advocacy, and self-efficacy [19]. Resilience is considered an attribute that supports health outcomes for those who have been exposed to trauma, abuse, or environmental. Resilience throughout the life course enhances the ability to recover from adversity, thrive with a sustained purpose, and grow in a world of change, trauma, and chronic illness. Resilience allows individuals to adapt to the wear and tear of living while coping with problems and crises in ways that leave them feeling stronger and wiser than they would have been if they had not encountered those problems and improved healthspan.

4. Operationalization of Vital Signs

4.1. Body Temperature

Operationalization of temperature involves the assessment and management of a physiologic or pathologic process that affects thermoregulation. Tracking processes such as ovulation which causes a temperature rise is useful for those desiring pregnancy. Restoration of normal body temperature may be an indication of the resolution of a disease process. Slight elevations in temperature, though, are a normal immune response and do not necessarily demand pharmacological intervention. Moreover, the use of pharmacological agents to reduce fevers brings risks in masking the true nature of a disease process.

4.2. Pulse

Operationalization of the pulse includes assessing the rate, rhythm, and strength of the palpated pulse at sites throughout the body as appropriate. Comparing pulse rate from various sources of the body such as left to right radial pulses, or lower extremity pulses distal to proximal. Pulse integrity is vital in the assessment of cardiovascular status and peripheral perfusion. Pulse rate is important in monitoring a disease process or preparing for a procedure, such as the Allen test to confirm ulnar perfusion.

4.3. Respiration

Operationalization of the respiratory rate involves observing the rise and fall of the chest for a full minute. Assessment of the respiration rate could be performed discreetly as knowledge that breaths are being counted can affect the rate. Assessment of rate, depth, and effort becomes part of the diagnostic process as well as the evaluation of treatment.

4.4. Blood Pressure

New guidelines consider any blood pressure of 140/90 as elevated and requiring intervention. Blood pressure may fluctuate dynamically in an acute medical situation that is monitored hourly or sooner or it may be monitored at home over time.

The blood pressure reading is only a guide. A single blood pressure measurement that is higher than normal is not necessarily an indication of a problem. It may be necessary to collect multiple blood pressure measurements over several days or weeks before making a diagnosis of high blood pressure and starting treatment.

4.5. Pain: Its Aspects and Effects

Pain severity contains pain-related interference with activities (disability) and the intensity of pain. It was found that these two aspects of pain severity may form a bidimensional or a one-dimensional scale (depending on the specific instruments used. High intercorrelations between pain-intensity measures and pain-related disability measures support the concept of using them as a unitary construct of pain severity [11]. The pain experience contains pain intensity and pain effect. Pain intensity describes *how* much *a* patient is in pain whereas pain effect describes the 'degree of emotional arousal or changes in action readiness caused by the sensory experience of pain. As the perception of pain may differ within a period, recent studies have mentioned that it is more valuable to ask patients to rate their 'usual' pain on average over a past short period, e.g., 1 week, than to ask for 'current' pain at the specific time of fulfilling a questionnaire [29]. It must also be kept in mind that the same method of assessing pain may have different thresholds of clinical significance, depending on the setting, for example, acute or chronic pain [11] [30] [31].

Visual Analogue Scale/Graphic Rating Scale for Pain

The Visual Analogue Scale (VAS) consists of a straight line with the endpoints defining extreme limits such as 'no pain at all' and 'pain as bad as it could be [11].

4.6. Operationalization of Resilience

We suggest measuring resilience subjectively and objectively as a vital contribution to routine health assessments. To measure psychological resilience subjectively, we suggest using a revised version of the Connor-Davidson Resilience

Scale. The revised CD-RISC comprises 5 items, and each item on the scale is rated on a 5-point Likert scale from 0 (not true) to 4 (true nearly all the time). The 5 items are: 1) I can adapt when changes occur, 2) I can deal with whatever comes my way, 3) Cope with stress can make me feel stronger, 4) I am not easily discouraged by failure, and 5) Under pressure, I stay focused and think clearly. The total score ranges from 0 to 20, with higher total scores indicating greater resilience. The Connor-Davidson Resilience Scale demonstrated good construct validity and internal consistency (α = 0.85) during the development of the scale [32]. The CD-RISC-10 also had a good Cronbach's alpha level of 0.85. The revised CD-RISC interview can be completed in 2 - 3 minutes. The scale can easily be incorporated into a practitioner's assessment protocol. Patients can complete the scale while waiting to see their provider. Obstacles associated with the incorporation of the scale and resilience as a vital sign may follow a course comparable to the incorporation of pain as a vital.

To measure resilience objectively, we suggest using Immune Resilience (IR) levels, the level of resilience to preserve and/or rapidly restore immune resilience functions that promote disease resistance and control inflammation and other inflammatory stress. IR levels according to [33] are assessed with peripheral blood metrics that quantify the balance between CD8 and CD4 T-cell levels and saliva metrics of gene expression signatures tracking longevity-associated immunocompetence and mortality- or entropy-associated inflammation. Using whole blood and flow cytometric analysis (e.g., cell counting, cell sorting, cell function), a well-known method, the CD4-CD8 ratio can be accurately measured. IR deregulation is potentially reversible by decreasing inflammatory stress. IR metrics and mechanisms have utility as vital signs of biomarkers for measuring immune health and improving health outcomes [14].

We can begin to look at the mechanisms that drive resilience, allowing a person to rebound from previous disease, injury, or adversity. The Trans National Institute Resilience Working Group has developed a three-component resilience framework that outlines the mechanisms of resilience. The framework begins with a challenge in the form of a stressor that affects a system composed of the environment, community, or individuals, resulting in a response. The response is described as resistance that can lead to collapse to growth/recovery (https://ods.od.nih.gov/Research/resilience.aspx) [33].

Considering the various degrees to which recovery occurs among people, there must be variability in the mechanisms that drive this response. We can see this trend through tangible measurements of resilience, both biological and psychological. Ahuja labeled the biological aspect "immune resilience" (IR) [14], while the psychological aspect has been substantiated by Connor and David [4].

Biological Measurement of Immune Resilience

The immune system is the body's inherent defense system and is constantly fighting off stressors with which the body is confronted. Resilience encompasses the ability to fight off stressors; therefore, it makes sense that there would be a chemical mechanism behind resilience. One of the only studies conducted about this was done by [14], who aimed to define the term "immune resilience" in terms of measurable hematologic and genetic markers. The study (n = 48,500) consisted of multiple observational study phases of various methods: some longitudinal, some prospective. Each phase of the study involved a group of people, sometimes controlled for age, sex, or both, who had been exposed to some medium of antigenic stimulation, including HIV, COVID-19, sepsis, or common viral respiratory infection. Individuals with high immunocompetence and low inflammatory processes had an increased lifespan, and an increase in COVID-19 survival, and sepsis survival. From their observations, the group determined two concrete facets of the immune system that are associated with trends in response to antigenic stimulation: the CD4-CD8 ratio, and gene expression.

The CD4-CD8 Ratio: Immune Health Grades

CD4 and CD8 cells are both T-cell lymphocytes that function within the immune system. CD4 cells are known as helper cells and have a high-level role in directing mechanisms of immune response, which includes regulating CD8 cell function. CD8 cells are known as cytotoxic cells, which are directly responsible for destroying pathogenic cells [34]. A high quantity of CD4 cells indicates greater immune preparedness (and a stronger immune system), whereas a high quantity of CD8 cells indicates an active response to infection or inflammation. A state of optimal health consists of a higher CD4 cell count and a lower CD8 cell count; thus, a normal CD4-CD8 ratio is one (1). For reference, normal CD4 cell counts are between 500 and 1200, while normal CD8 counts are between 150 and 1000 [35]. To distinguish levels of CD4-CD8 balance, Ahuja and colleagues developed the concept of "immune health grades." [14] An immune health grade (IHG) of 1 represented "optimal immune resilience (IR)" where CD4 cell counts are high and the CD4-CD8 ratio is one (1) or proximate to 1. An IHG of 2 was less optimal, with low CD4 counts but a ratio still greater than one. IHG-3 had high CD4 counts but a ratio of less than one. IHG-4 was deemed the least optimal IR, with low CD4 and a ratio of less than one. These proportions can be visualized in **Figure 1** [14].

The Immune health grade proposed by Ahuja *et al.* [14] can be used by practitioners to understand the clinical application of IR and the CD4-CD8 ratio. An immune health grade of one (optimal state) is associated with a CD4-CD8 ratio of one or near one and suggests no need to immediately intervene. With the erosion of immunocompetence and an increase in inflammatory processes, the immune health grade changes from one to two, three, or four. A change in the health grade can prompt the practitioner to intervene because the optimate state no longer exists.

Gene Expression: Transcriptomic Profiles

The group was also able to identify genetic sequences that were associated with specific health outcomes after antigenic stimulation. Some gene signatures resulted in traits that allowed for patient survival (survival-associated signature/SAS-1), while others led to patient entropy (mortality-associated signature/MAS-1). It could be assumed that a greater number of survival-associated

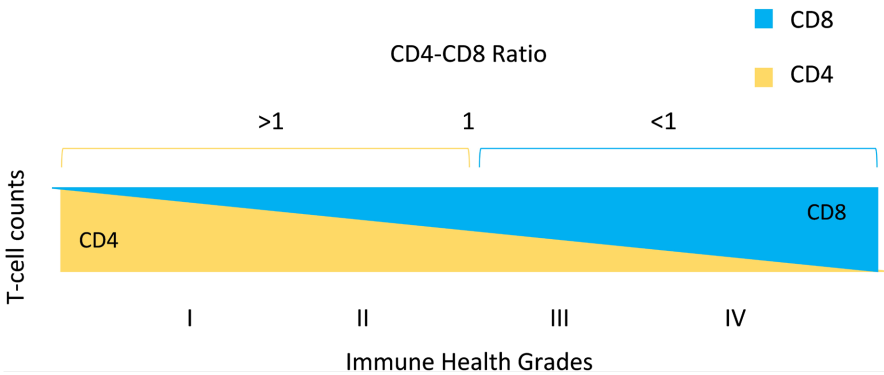

Figure 1. Optimal immune resilience is represented by a CD4-CD8 cell ratio of 1 and has been labeled by Ahuja and others as Immune Health Grade (IHG) 1. As the CD4-CD8 cell ratio decreases (<1) or increases (>1 one), immune resilience becomes less optimal. Four basic IHGs were identified in this study [14].

traits would correlate with greater immunocompetence (IC) and IC-related genes. Conversely, it could be assumed that a greater number of entropy-associated traits would correlate with greater inflammation (IF) and IF-related genes. The ideal profile, and an indicator of optimal IR using these metrics, would be SAS-1^{high}-MAS-1^{low} because it represents high immunocompetence and low inflammation and was predicted to result in the greatest longevity (**Figure 2**). Longevity has been refined based on a continuum of survival and entropy; when referred to in this biological context, entropy means degradation of the body trending toward death [36] [37].

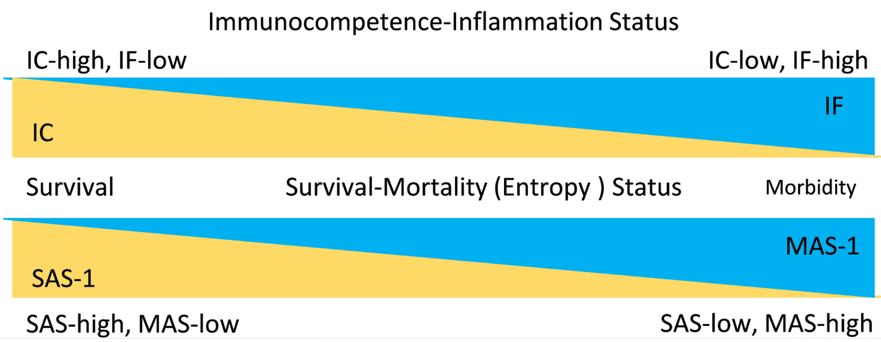

Figure 2. Immunocompetence (IC) vs. inflammation (IF), survival vs. mortality (entropy), and survival-associated signature (SAS-1)/mortality (entropy)-associated signature (MAS-1) profiles are interrelated and reflect immune resilience. High IC and low IF, increased survival and decreased entropy, and high SAS-1 and low MAS-1 all indicate optimal immune resilience. When one of these metrics changes, so do the others, and consequently, optimal immune resilience status is affected [14].

5. Discussion

The inclusion of resilience as the sixth vital sign and its measurement in patients can help healthcare providers to better understand the overall health of the individual. Resilience level is also a marker of how well a person may tolerate future physical and mental health stressors and be able to recover. For an aging population, unveiling past trauma to promote well-being is not a feasible approach. Instead, measuring the level of resilience provides the individual and their healthcare provider with tangible goals that are positive and preventative. Rather than respond to pathology, healthcare providers are supporting interventions to improve resiliency which has a short-term effect on healthspan and a long-term effect on lifespan.

While there exist validated pathologies to measure the five vital signs, such as body temperature, pulse rate, respiratory rate, blood pressure, and pain, there also exist validated subjective and objective measures to determine resilience. The CD-RISC, validated in adults [32], can show levels of resilience in adult patients. Furthermore, the use of biomarkers such as immune resilience (IR) levels suggested by Ahuja *et al.* [14] not only objectively indicates levels of resilience in the patient, but also supports the patient's response to the CD-RISC. Measuring resilience can inform other vital signs and explain a deviation from the norm. For instance, someone with a high heart rate may also report low resilience levels, which would require further investigation and intervention. Moreover, an imbalance between longevity-associated immunocompetence and entropy or mortality-associated inflammation needs follow-up.

Ahuja *et al.*, [14]) suggest acute inflammatory stress associated with symptomatic common respiratory viral infections is a strong signal for rapid degradation of immune resilience which correlates with a gene expression signature status linked to entropy or mortality both during aging and in immunosuppression. Just as relationships between the other vital signs can be found due to a variety of health problems (*i.e.*, high heart rate and low blood pressure due to hypovolemia), further investigations to determine how resilience levels relate to deviations in the other vital signs and how other vital signs relate to resilience is important. The work by Ahuja *et al.* [14] does provide a framework for understanding the connection between resilience and other vital signs. A decrease in immune competence (IC) is negatively correlated with an increase in inflammatory processes (IF). An increase in IF is often manifested by signs and symptoms of infections empirically linked to an increase in temperature, pulse, respiration, and pain. For systemic infections, blood pressure typically trends downward. Immune resilience drives and is impacted by other vitals, and changes in vital signs can suggest changes in immune resistance.

Measurement of resilience is as critical as other parameters conducted when caring for a patient to maximize their physical and mental health. Patients develop and summon resilience in response to stressors, and it is important to assess and appropriately intervene when resilience is diminished or degraded. Assessing resilience is important. Including resilience as the sixth vital sign is imperative. Additionally, measuring resilience allows practitioners to determine an individual's vulnerability to trauma and stress over the lifespan. Thus, the practitioner is better able to select and implement evidence-based treatment protocols. Resilience is predictive of increased morbidity and mortality associated with autoimmune disease, cardiovascular disease, COVID-19, and mental health conditions [38]-[41].

6. Conclusions

The importance of monitoring resilience across the healthspan and lifespan is that acute and inflammatory stress degrades resilience and in return, the degradation of resilience correlates with immunosuppression. Degradation for each vital sign affects and is affected by other vital signs and other body functions, including resilience. Degradation is reversible through each specific mechanical, pharmaceutical, physical, and psychological intervention. Interventions for each of the first 5 vital signs are tested and effective, but resilience (psychological and immune resilience) is ongoing. Yet, as a marker of health and healthspan, integrating resilience into every plan of care facilitates an intervention to improve degraded resilience and inflammatory processes and support the health and well-being of the whole person. Resilience is activated and typically begins before, during, or after a stressor appears [42]. A recent systematic review (n = 221 studies) [43] supports the adoption of interventions centered on resilience (*i.e.*, training programs). The review found that resilience training had a small effect on both anxiety and quality of life. However, a moderate effect was found for resilience training programs and depressive symptoms. No overall effect of resilience on social support was found. Data on the effect of resilience intervention on support should be viewed with caution given the number of studies was four.

The resilience phenomenon can stand alone but it can be enhanced with social support through resilience-informed care [20] [44]. Resilience is fungible. Degradation of resilience is potentially reversible by decreasing inflammatory stress and increasing interventions such as social support. There may not be a need to know the specifics of trauma, stressors, or past illnesses if resilience is a vital sign, supporting recovery after adversity. Individuals throughout their healthspan and lifespan possess resilience but just like the other vital signs, it needs measurement so that it can be maintained, or replenished [45]. Resilience-informed care as an intervention may alter negative perceptions into positive affirmations and mastery development enhancing a sense of achievement and empowerment. These are the potential impacts of resilient-informed care as an intervention that supports the immune-supportive hypothesized outcomes through the analyses of quantitative and qualitative data by mixed methods methodology where qualitative data may be quantified, and quantitative data may be qualified [24] [46].

Why do some older adults resist manifesting these attributes consistent with an immunosuppressive-proinflammatory state predisposing to increased disease risks/severity and mortality? "The conundrum points to an immunosuppressive-pro-inflammatory process that is not directly attributable to aging; we posited this process relates to the failure, at any age, to preserve and/or restore optimal immune resilience when experiencing (antigenic) stressors" (Ahuja *et al.*, p. 17) [14]. Infections, illnesses, and stressors are a regular part of the lived experience. Healthcare providers' role is to provide patients with a safe space when stressors and challenges occur, to minimize negative effects, and to enhance resilience in promoting healthspan and lifespan.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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