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Post–Intensive Care Syndrome: Nursing Assessment, Long-Term Sequelae, and Interprofessional Rehabilitation Strategies

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Abstract

Background: Advances in critical care have improved survival rates, but many ICU survivors experience persistent physical, cognitive, and psychological impairments collectively termed Post–Intensive Care Syndrome (PICS). These sequelae also affect family members (PICS-F) and pediatric populations (PICS-p), creating multidimensional recovery challenges.

Aim: To review the etiology, epidemiology, pathophysiology, assessment, and management strategies for PICS, emphasizing nursing roles and interprofessional collaboration.

Methods: A comprehensive literature synthesis was conducted, integrating evidence from multicenter cohort studies, systematic reviews, and expert consensus guidelines to outline PICS domains, risk factors, and prevention frameworks.

Results: PICS prevalence is high: physical impairment occurs in 25–80% of adult ICU survivors, cognitive deficits in up to 80%, and PTSD in up to 50%. Family members exhibit anxiety and depression in up to 75% of cases. Pediatric survivors face functional limitations affecting school and social integration. Etiology is multifactorial, involving ICU-acquired weakness, systemic inflammation, delirium, metabolic instability, and psychological trauma. The ABCDEF bundle—addressing pain, sedation, delirium, mobility, and family engagement—emerges as the cornerstone of prevention. Post-discharge interventions, including ICU diaries and telemedicine follow-up, offer modest benefits but remain essential for continuity of care.

Conclusion: PICS represents a predictable consequence of critical illness requiring proactive prevention during ICU care and structured post-discharge evaluation. Nursing leadership is pivotal in implementing prevention bundles, educating families, and coordinating multidisciplinary rehabilitation.

Keywords: Post–Intensive Care Syndrome, ICU survivorship, ABCDEF bundle, nursing assessment, rehabilitation, PICS-F, PICS-p.

Introduction

Advances in critical care medicine over the past half-century have transformed the prognosis of many life-threatening illnesses. Improvements in hemodynamic monitoring, mechanical ventilation strategies, antimicrobial therapy, organ support technologies, and standardized ICU protocols have contributed to marked gains in short-term survival. Yet as mortality has declined, a parallel reality has become increasingly evident: survival from critical illness does not necessarily equate to full recovery. Many patients who leave the intensive care unit (ICU) experience new or worsened impairments that extend well beyond hospital discharge and may persist for months or years. These sequelae often manifest as reductions in physical capacity and endurance, persistent cognitive dysfunction affecting memory or executive function, and a broad range of psychological disturbances. In addition to the patient's recovery trajectory, the experience of critical

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illness frequently exerts profound emotional and practical burdens on family members, who may develop their own mental health symptoms during and after the ICU course. This shift in focus—from survival alone to long-term survivorship outcomes—has reframed ICU care as the beginning of a recovery continuum rather than the endpoint of treatment [1][2]. Within this context, psychiatric consequences have been recognized as both common and clinically meaningful among ICU survivors. Anxiety, depression, and post-traumatic stress disorder (PTSD) are reported with notable frequency, and these conditions can interact bidirectionally with physical and cognitive limitations. For example, persistent dyspnea, weakness, or fatigue may reinforce anxiety; difficulties with concentration and memory may impair reintegration into work and social roles; and intrusive recollections of the ICU environment may disrupt sleep and undermine adherence to rehabilitation plans. Importantly, these psychiatric sequelae are not confined to patients. Family members and informal caregivers—often the individuals who must coordinate follow-up care, provide emotional support, and manage household disruption—are also vulnerable to anxiety, depression, and trauma-related symptoms. The ICU experience can therefore generate a multidimensional recovery challenge that encompasses the patient's body, mind, and social context.

To capture this phenomenon in a clinically useful way, attendees at a 2010 meeting of the Society of Critical Care Medicine introduced the term Post-Intensive Care Syndrome (PICS). PICS refers to new or persistent declines in physical, cognitive, and mental health functioning that occur after critical illness and an ICU stay, and that cannot be better explained by other primary conditions such as traumatic brain injury (TBI) or cerebrovascular accident (CVA).[1] This definitional emphasis is important: it distinguishes PICS as an outcome syndrome arising from the exposure to critical illness and intensive care, rather than from an independent neurologic event that would predict impairment regardless of ICU factors. PICS thus provides a conceptual framework for clinicians and nurses to anticipate, screen for, and address the clustered impairments that can follow ICU discharge. Rather than treating weakness, memory difficulty, and emotional distress as isolated problems, the PICS framework highlights their common co-occurrence and shared risk profile, encouraging integrated assessment and coordinated rehabilitation [1][2]. The interdependence of ICU survivors and their families prompted further refinement of the framework. The term PICS-F is used to describe adverse mental health outcomes in close family members of ICU patients, with commonly reported manifestations including sleep deprivation, anxiety, depression, and complicated grief.[1] PICS-F underscores that critical illness is rarely an individual event; it is a family crisis that can reverberate through emotional wellbeing, family roles, and caregiving capacity. Family distress, in turn, can influence patient outcomes, because caregivers often support medication adherence, appointment attendance, nutrition, and gradual activity progression. When caregivers experience severe anxiety, depression, or insomnia, their ability to provide consistent support may be compromised, and the household may struggle to reestablish stability. Conceptually, PICS-F also validates the lived experiences of families who feel unprepared for the post-ICU period and may interpret persistent symptoms as unexpected or alarming, particularly when discharge from the ICU is perceived as "recovery." By identifying PICS-F as a legitimate clinical concern, the framework encourages early counseling, referral pathways, and supportive interventions for caregivers rather than limiting follow-up care to the patient alone.

The relevance of PICS becomes even more complex when considered in pediatric critical care. Over recent decades, utilization of pediatric ICUs (PICUs) has increased, while mortality in critically ill children has steadily declined. The result is a growing population of pediatric ICU survivors who may be vulnerable to PICS-related impairments. Unlike adult survivors—whose recovery typically occurs within established vocational and social identities—children recover within an active, rapidly evolving developmental landscape. The impact of critical illness on physical function, cognition, emotional regulation, and social integration can therefore intersect with neurodevelopmental milestones, educational trajectories, and psychosocial maturation. Even modest deficits in attention, memory, or stamina may have outsized consequences when they disrupt school performance or peer relationships during key periods of development. Additionally, children may have limited capacity to articulate distress, trauma memories, or cognitive changes, making structured screening and family-centered assessment particularly important [1][2]. Pediatric recovery also unavoidably involves caregivers because healthy children are inherently dependent on parents or guardians for daily needs, decision-making, and access to healthcare services. Consequently, a child's recovery after a PICU stay can affect the entire family system, including siblings who may experience feelings of fear, neglect, jealousy, or confusion during prolonged hospitalizations and their aftermath. Reintegration into school and peer groups is a distinct challenge for pediatric ICU survivors, particularly when lingering fatigue, weakness, or emotional lability limits participation in academic and social activities. Children may face anxiety about separation from parents, heightened sensitivity to bodily sensations, or fear of recurrence of illness. Families may also encounter practical barriers, including the need for frequent follow-up appointments, rehabilitation

sessions, and school accommodations, all of which require time, transportation, and sustained caregiver engagement.

The economic consequences of pediatric critical illness further amplify the social dimension of recovery. Parents of critically ill children often reduce work hours or leave employment altogether to remain at the bedside during hospitalization and to manage complex needs after discharge. These disruptions can produce financial strain that persists long after the acute illness resolves, affecting household stability, access to supportive services, and overall family wellbeing. Recognizing that pediatric critical illness influences not only the child's physical, cognitive, and mental health but also the family's social functioning, the PICS-pediatric (PICS-p) framework incorporates a fourth domain: social health, applicable to all family members of the PICU patient.[2] This expansion is clinically significant because it legitimizes outcomes such as school reintegration difficulties, caregiver employment disruption, and family relational stress as integral components of post-ICU morbidity rather than secondary issues outside the scope of clinical recovery [1][2]. Together, these conceptual developments reflect a broader evolution in critical care: the field increasingly acknowledges that ICU care must be measured not only by survival and discharge metrics but also by long-term function, mental health, and family-centered outcomes. The PICS and PICS-F frameworks provide clinicians—particularly nurses who are deeply involved in patient education, discharge planning, and continuity of care—with a structured lens through which to anticipate persistent impairments, normalize patient and family experiences, and coordinate early, multidisciplinary interventions. As ICU survivorship becomes more common, effective identification and management of PICS and its pediatric adaptations will remain essential for improving quality of life, restoring functional independence, and supporting families through the prolonged recovery that often follows critical illness.[1][2]

Etiology

The etiology of Post–Intensive Care Syndrome (PICS) is multifactorial and reflects the cumulative physiologic and psychological burdens of critical illness, prolonged organ support, and the ICU environment itself. Rather than arising from a single pathologic mechanism, PICS represents an interrelated set of post-ICU impairments spanning physical, cognitive, and mental health domains, often with reciprocal reinforcement among them. Physical limitations may increase the risk of depression and anxiety through loss of independence, while cognitive deficits can hinder rehabilitation adherence and return-to-work plans, creating additional psychological distress. Appreciating this interconnected etiology is essential in nursing and interprofessional practice because effective prevention and management require early recognition of risk factors, individualized ICU care strategies, and structured follow-up. A substantial proportion of prolonged physical impairment in PICS is attributable to ICU-acquired weakness (ICUAW), which is defined as a diffuse, symmetrical reduction in skeletal muscle strength for which alternative etiologies have been excluded. Clinically, ICUAW can manifest as generalized limb weakness, reduced endurance, impaired trunk stability, and functional dependency. It may also present with more specific impairments such as difficulty weaning from mechanical ventilation, as well as problems with speaking and swallowing, reflecting weakness of respiratory and bulbar musculature. ICUAW is not a monolithic entity; it is typically subdivided into muscle deconditioning, critical illness polyneuropathy (CIP), and critical illness myopathy (CIM). Importantly, CIP and CIM frequently coexist, producing a combined syndrome termed critical illness neuromyopathy (CINM).[3] This classification matters clinically because it highlights that ICUAW may involve both myopathic and neuropathic components, which can influence recovery time, response to rehabilitation, and the need for specialized diagnostic evaluation. Mechanical ventilation is a major contributor to muscle wasting, particularly of the respiratory musculature. Ventilatory support can "unload" the diaphragm and accessory respiratory muscles by reducing the work of breathing, and this reduction in physiologic demand leads to rapid disuse atrophy. Strikingly, diaphragmatic thinning can be detected by computed tomography within as little as two days of mechanical ventilation, underscoring the speed with which critical illness and organ support can remodel skeletal muscle.[4] In many patients, tolerance of endotracheal intubation and ventilator support requires opiates and sedative agents that blunt respiratory drive and reduce voluntary movement. This pharmacologic suppression further dampens neural activation of respiratory muscles, thereby intensifying disuse-mediated atrophy.[3] The clinical implication is that ventilator dependency is not only a marker of illness severity but also an active driver of downstream impairment, particularly when sedation is deep or prolonged.

In some cases, neuromuscular blocking agents are administered to improve patient–ventilator synchrony or facilitate lung-protective ventilation, such as in severe acute respiratory distress syndrome (ARDS). Although neuromuscular blockade may be lifesaving in select settings, it can also contribute to weakness that may persist for up to a week after cessation. The resulting weakness may mimic denervation-related myopathy observed after spinal injury or other neurologic insults, illustrating how pharmacologic paralysis can have lingering

functional consequences beyond its period of administration.[5] This risk is compounded by the broader immobilization typical of ICU care. Prolonged bed rest, limited ambulation, and reduced active movement rapidly weaken limb and trunk muscles, contributing to decreased functional reserve even in patients who previously had good baseline strength. The combination of mechanical ventilation–related diaphragm disuse and generalized immobilization of peripheral musculature provides a physiologically plausible foundation for the profound deconditioning that characterizes many ICU survivors. However, ICUAW is not simply disuse atrophy. The metabolic and inflammatory milieu of critical illness amplifies muscle injury through pathways that impair protein synthesis and accelerate proteolysis. Systemic inflammatory mediators, electrolyte abnormalities, endocrine dysfunction, and poor nutritional status commonly converge in critically ill patients, each contributing to catabolism and myopathy.[3] Inflammatory cytokines can alter muscle protein turnover and mitochondrial function, while electrolyte derangements can impair neuromuscular excitability and contribute to weakness. Endocrine abnormalities—such as insulin resistance, stress hyperglycemia, and alterations in cortisol and thyroid axis function—may further shift metabolism toward catabolism and muscle breakdown. Malnutrition, which can arise from inadequate intake, feeding intolerance, or delayed initiation of nutrition support, deprives muscle tissue of the substrates required for repair and synthesis. Collectively, these factors suggest that ICUAW is often the result of a convergence of disuse, inflammation, and metabolic dysregulation rather than a single isolated cause. Vitamin D deficiency has also been proposed as an underrecognized and potentially reversible contributor to skeletal muscle weakness in ICU settings. Vitamin D deficiency is common in the general population and may be exacerbated during hospitalization due to limited sunlight exposure. This is particularly relevant among individuals with darker skin tones, for whom baseline risk of deficiency can be higher and the impact of reduced ultraviolet exposure more pronounced.[6] Because vitamin D influences muscle function and neuromuscular performance, deficiency may worsen weakness and delay recovery. The clinical value of this observation lies in its modifiability: vitamin D levels can be assessed and corrected, offering a potentially low-risk supportive intervention within broader rehabilitation strategies. Alongside vitamin D deficiency, microvascular ischemia has been suggested as another contributor to ICUAW, particularly to its neuropathic components. Reduced microcirculatory perfusion and inflammatory vascular injury may compromise peripheral nerve integrity, helping explain why CIP may develop in severe systemic illness.[7] These mechanisms further reinforce that ICUAW represents systemic critical illness effects on both muscle and nerve rather than purely mechanical disuse.

Cognitive impairment is another core domain of PICS and can manifest as deficits in attention, memory, and processing speed that persist for months or even years following ICU discharge.[8] The etiologic pathways leading to post-ICU cognitive deficits are complex and likely include both direct physiologic insults and indirect neuropsychiatric factors. Metabolic instability has been repeatedly implicated, with risk factors including prolonged or frequent episodes of hyperglycemia and hypoglycemia. These glycemic extremes can adversely affect neuronal function and may contribute to longer-term cognitive vulnerability in ICU survivors, particularly when superimposed on pre-existing cognitive deficits.[7] Hypoxia represents another plausible mechanism. A large study of ARDS patients published in 1999 found that more prolonged and more profound periods of hypoxemia during the ICU course were associated with increased risk of cognitive deficits one year later.[9] This observation supports the biologic plausibility that insufficient cerebral oxygen delivery during critical illness can produce enduring impairment, even when overt focal neurologic injury is not present. Among the most robustly supported contributors to post-ICU cognitive dysfunction is ICU delirium. Delirium is common in critically ill patients and reflects acute brain dysfunction, characterized by fluctuating attention, altered arousal, disorganized thinking, and perceptual disturbances. The link between delirium and longer-term cognitive outcomes has been strengthened by prospective research. The 2013 BRAIN-ICU study, which included more than 800 ICU patients, demonstrated that longer duration of delirium—though not coma—was associated with increased risk of cognitive impairment one year after discharge.[10] This finding is clinically consequential because it highlights delirium duration as a potentially modifiable risk marker. It suggests that delirium is not merely a transient inconvenience but may represent an acute insult that leaves a lasting imprint on cognitive function. For nurses, this reinforces the importance of delirium screening, sedation minimization strategies, sleep promotion, early mobilization, and orientation interventions as part of routine ICU care. Mental health impairments, including depression, anxiety, and post-traumatic stress disorder (PTSD), form the third major domain of PICS etiology. These psychiatric sequelae are understandable given the inherently stressful nature of the ICU experience, which may be isolating, frightening, and dehumanizing. Patients are often exposed to invasive procedures, persistent discomfort, and physiologic distress such as dyspnea. Sedation, delirium, and sleep disruption can produce profound disorientation, fragment memories, and contribute to frightening hallucinations or misinterpretations of care events. Risk factors for

post-ICU mental health problems include a personal history of psychiatric illness, female gender, and younger age. ICU exposures themselves also matter: use of sedative agents and limited factual recall of the ICU stay have been associated with increased risk of subsequent mental health impairment, suggesting that memory fragmentation may leave patients with unresolved fear and intrusive interpretations.[11] Conversely, the emergence of intrusive traumatic memories and nightmares during hospitalization may signal the onset of trauma-related pathology that persists after discharge.[11] The interplay between physiologic insults and psychiatric outcomes is also notable. There is evidence indicating that hypoglycemia and hypoxia—already linked to cognitive deficits—may also contribute to depressive symptoms, suggesting overlapping biological vulnerabilities across the cognitive and emotional domains of PICS.[12][13]

The etiology of PICS extends beyond the patient to encompass the psychological burden experienced by families, described as PICS-F. Being the family member of an ICU patient frequently entails prolonged uncertainty, fear of death, disrupted routines, financial strain, and exposure to distressing clinical events. These stressors can culminate in sleep deprivation, anxiety, depression, and complicated grief. Risk factors for developing PICS-F include female gender, younger age, lower educational level, and a prior history of mental health disorders. Spouses of ICU patients are particularly vulnerable, as are unmarried parents of critically ill children. Nonetheless, overall, family members of pediatric ICU patients may be less likely to develop PICS-F than family members of adult ICU patients, suggesting that contextual factors—such as expectations, social support, or coping frameworks—may differ between populations.[14] A particularly nuanced aspect of PICS-F etiology concerns the role of family involvement in medical decision-making. Evidence is mixed regarding whether being involved in decisions is protective or predictive of later psychological harm, and cultural factors may help explain differences across studies. For example, a French study reported that being a decision-maker—and especially participating in end-of-life decisions—was associated with increased risk of PICS-F, implying that the burden of responsibility and moral distress can be traumatic.[15] In contrast, a US study found that family members who adopted a passive role in decision-making were at higher risk for adverse mental health sequelae.[16] These seemingly contradictory findings may be reconciled by considering cultural norms and healthcare system expectations. Shared decision-making is widely established and culturally expected in the United States, and family members who feel excluded or passive may experience helplessness, loss of control, or unresolved uncertainty that intensifies distress.[14] In settings where shared decision-making is less entrenched, such as in some French contexts, sudden responsibility for major decisions may feel unfamiliar and psychologically overwhelming, thereby increasing trauma and later grief symptoms.[14] This interpretation underscores that PICS-F is not merely an individual psychological reaction but is shaped by the social and cultural context in which ICU care occurs. In summary, the etiology of PICS reflects a convergence of physiologic injury, critical care exposures, and psychological stressors. Physical impairments are strongly linked to ICUAW and its subtypes—deconditioning, CIP, CIM, and CINM—driven by mechanical ventilation–related unloading, sedation, neuromuscular blockade, immobilization, inflammation, metabolic dysfunction, nutritional compromise, vitamin D deficiency, and microvascular injury.[3][4][5][6][7] Cognitive deficits relate to metabolic extremes, hypoxemia, pre-existing vulnerability, and especially delirium duration.[7][8][9][10] Mental health sequelae arise from the traumatic ICU experience and are shaped by patient characteristics, sedation exposure, memory disruption, and physiologic stressors.[11][12][13] Finally, family outcomes captured by PICS-F arise from the psychological and social burdens of critical illness, with decision-making roles and cultural context influencing risk.[14][15][16] Understanding these mechanisms provides a basis for prevention-focused ICU practices and post-discharge rehabilitation pathways in which nursing assessment and interprofessional collaboration are central.

Epidemiology

The epidemiology of Post–Intensive Care Syndrome (PICS) reflects a paradox of modern critical care: as advances in ICU medicine improve short-term survival, they simultaneously expand the population living with the long-term sequelae of critical illness. Two macro-level trends amplify this effect. First, the global population is aging, increasing the number of individuals with chronic comorbidities who are vulnerable to critical illness and ICU admission. Second, ICU survival has improved across many disease categories through refined ventilation strategies, sepsis management protocols, hemodynamic monitoring, renal replacement therapies, and multidisciplinary supportive care. As a result, more patients are surviving conditions that were previously fatal, yet many survivors experience persistent impairments that extend into their lives and communities. This expanding survivor population has made PICS in patients, PICS-f in family members, and PICS-p in children increasingly visible and clinically relevant.[17] Estimating the prevalence of these syndromes is challenging because reported rates vary substantially across the scientific literature. Differences in study populations, ICU diagnoses, severity of illness, baseline comorbidity burden, and sociodemographic factors all influence outcomes.

Furthermore, follow-up time points differ, ranging from weeks after discharge to several years, and outcome measures vary from objective physical performance tests to self-reported questionnaires. Methodologic heterogeneity also arises from different definitions of impairment thresholds, varying sensitivity of cognitive and psychological screening tools, and differences in how investigators account for pre-ICU baseline function. Despite this variability, there is broad agreement that PICS, PICS-f, and PICS-p are common, occur across cultures, and represent typical sequelae of surviving critical illness rather than rare complications.[17] This consensus is epidemiologically important because it establishes PICS as a predictable public health burden linked to the growing ICU survivor population.

Among adult ICU survivors, physical impairment is widely reported, with prevalence estimates ranging from 25% to as high as 80%.[18] Such impairment often includes reduced exercise tolerance, persistent weakness, limitations in mobility, and diminished ability to resume premorbid activities. The wide range reflects differences in both measurement approaches and patient populations. Physical impairment appears particularly prevalent among survivors of sepsis,[18] a pattern that is biologically plausible given the systemic inflammatory response characteristic of sepsis and the proposed role of inflammatory cytokines in the pathogenesis of ICU-acquired weakness (ICUAW).[19] Epidemiologically, this suggests that certain diagnostic categories—especially those associated with profound inflammation, prolonged mechanical ventilation, and extended immobilization—carry higher risk of long-term functional decline. From a nursing and rehabilitation perspective, this also implies that prevention strategies and follow-up planning should prioritize high-risk groups such as sepsis survivors. Cognitive dysfunction is another highly prevalent domain of PICS, with reported rates reaching up to 80% of adult ICU survivors.[18] These deficits can include reduced attention, impaired short-term memory, slowed processing speed, and decreased executive function. While cognitive function often improves gradually over time, the epidemiologic signal indicates that for many patients, impairment can persist for years, particularly following recovery from acute respiratory distress syndrome (ARDS) or sepsis.[18] This persistence suggests that the neurologic consequences of critical illness may not be fully reversible and that cognitive recovery trajectories may be prolonged, variable, and influenced by both ICU exposures and patient vulnerabilities. The epidemiologic burden of cognitive dysfunction is especially consequential because it affects patients' ability to manage medications, return to employment, maintain independence, and participate fully in rehabilitation efforts. In this way, cognitive impairment may act as a multiplier of disability, increasing the likelihood that physical limitations and psychological distress will become chronic.

Psychological morbidity is similarly prominent. Rates of post-traumatic stress disorder (PTSD) have been reported in up to 50% of adult ICU survivors.[18] Importantly, PTSD symptoms may persist for years after discharge, suggesting that critical illness can function as a traumatic exposure with long-term mental health consequences.[18] Epidemiologically, this persistence indicates that PTSD is not merely a transient reaction to hospitalization but may represent an enduring disorder in a substantial subset of survivors. The ICU environment—characterized by fear, helplessness, invasive procedures, delirium, and fragmented memories—creates conditions in which traumatic stress responses can develop. PTSD in turn can worsen sleep disturbance, impair engagement with follow-up care, and increase the risk of comorbid anxiety and depression, reinforcing the multidomain nature of PICS. While domain-specific prevalence estimates are useful, a key epidemiologic insight is that PICS impairments frequently co-occur rather than occurring in isolation. The presence of impairments in multiple domains can amplify disability: physical weakness may limit social participation and increase depression risk; depression may reduce motivation for physiotherapy; and cognitive impairment may hinder adherence to treatment regimens. A recent study by Marra and colleagues examined this multidomain burden in 406 adult ICU survivors recruited from five U.S. medical centers and assessed the co-occurrence of PICS impairments at 3 and 12 months after discharge. The investigators found that 64% of survivors had one or more PICS impairments at 3 months and 56% at 12 months, indicating that a majority of ICU survivors continue to experience measurable impairment well into recovery.[20] The reduction in prevalence between 3 and 12 months suggests some degree of recovery over time, yet the persistence of impairment in more than half of survivors at one year highlights the chronicity of PICS for many. Notably, co-occurrence across two or more domains was common, and cognitive and psychological problems were identified as the most persistent over time.[20] This pattern suggests that even when physical function improves, cognitive and mental health sequelae may remain, requiring prolonged follow-up and targeted interventions. The Marra study also provides insight into factors associated with resilience. Increased educational level and lower frailty scores were positively correlated with being PICS-free at both follow-up points.[20] Epidemiologically, these associations suggest that social determinants of health and baseline physiologic reserve shape recovery trajectories. Higher education may serve as a proxy for health literacy, access to resources, and the capacity to

engage effectively with complex rehabilitation plans. Lower frailty reflects greater physiologic robustness and may predict better tolerance of both critical illness and the rehabilitation demands of recovery. For nursing teams, these findings support risk stratification approaches that incorporate both clinical vulnerability (frailty) and social vulnerability (education and related determinants), helping direct resources such as post-ICU clinics, home health services, and caregiver support.

Additional longitudinal cohort data further illuminate prevalence patterns. The BRAIN-ICU longitudinal cohort study of critical care survivors in the Nashville, Tennessee region reported a 29% prevalence of depression at 12 months after discharge, while the reported PTSD rate in that cohort was relatively low at 7%.[21] These findings highlight how PTSD prevalence can vary widely between studies, likely due to differences in screening instruments, ICU populations, and follow-up methods. Importantly, the BRAIN-ICU cohort also showed that functional dependency remained common: more than a quarter of survivors still required assistance with necessary activities of daily living (ADLs) one year after discharge.[21] From an epidemiologic standpoint, this is a critical marker of real-world disability, emphasizing that the burden of PICS is not limited to symptom scales but extends to persistent dependence that affects household functioning, healthcare utilization, and caregiver demand. The epidemiology of PICS must also incorporate family outcomes. PICS-f describes the psychological and social morbidity experienced by family members of ICU patients, and it is increasingly recognized as a common consequence of critical illness. Reports suggest that up to 75% of family members develop symptoms consistent with PICS-f, with approximately one-third requiring psychiatric medication for management.[18] Anxiety is the most frequently reported mental health problem among family members, while depression and PTSD are somewhat less common but remain substantial concerns.[14] These prevalence figures underscore that the ICU experience can be traumatic not only for patients but also for those who witness critical illness, navigate uncertainty, and often carry decision-making and caregiving burdens. The epidemiologic importance of PICS-f extends beyond mental health: PICS-f may worsen existing physical health problems in family members and contribute to financial strain and substance use issues, indicating a broader impact on social stability and health behaviors.[18] For healthcare systems, high PICS-f prevalence suggests that post-ICU recovery planning should explicitly incorporate family screening and support, because caregiver wellbeing can influence patient recovery and reduce preventable readmissions. The pediatric epidemiology of PICS—commonly framed as PICS-p—remains less precisely defined than adult PICS, largely because this framework has only recently been distinguished clearly from adult survivorship literature. Pediatric critical care outcomes are shaped by developmental factors that complicate measurement: tools must be age-appropriate, sensitive to neurodevelopmental trajectories, and capable of distinguishing illness-related impairment from normal developmental variability. A high-quality scoping review reported functional impairment rates as high as 36% at discharge, 26% at six months, and 19% at two years among pediatric ICU survivors.[22] These figures suggest that while many children recover progressively, a substantial subset experiences persistent functional limitations that can affect school participation, physical activity, and psychosocial development. The review also emphasized that measuring functional impairment in children is uniquely challenging because assessment instruments must be aligned with developmental stage and expected milestones.[22] Epidemiologically, this challenge can lead to underestimation or inconsistent reporting if measurement tools are poorly matched to age or if follow-up is incomplete.

Trends in pediatric ICU survival further amplify the importance of understanding PICS-p prevalence. In high-income countries, pediatric ICU mortality has decreased substantially since 2000, falling from approximately 5% to 2.5%.[22][23] This improvement in survival means that the absolute number of pediatric ICU survivors at risk for long-term morbidity is increasing, even if the proportion with impairment remains stable. Because children are more likely to survive critical illness than adults, the societal impact of persistent morbidity may be especially significant over the life course. Functional, cognitive, and emotional sequelae that persist after pediatric critical illness can influence educational attainment, social development, and long-term health trajectories, making PICS-p a priority area for surveillance and intervention. At the same time, because pediatric recovery is family-dependent, epidemiologic assessment must often include caregiver outcomes and family social health, reinforcing the integrated nature of PICS-p as a child-and-family syndrome. In sum, the epidemiology of PICS, PICS-f, and PICS-p demonstrates that post-ICU morbidity is common and persistent, and it extends beyond the patient to family systems. Adult survivors experience high rates of physical impairment (25–80%), cognitive dysfunction (up to 80%), and PTSD (up to 50%), with particularly high vulnerability among sepsis and ARDS survivors.[18][19] Multidomain co-occurrence is frequent, with a majority of survivors exhibiting impairment at both 3 and 12 months in multicenter research, and cognitive and psychological impairments showing notable persistence.[20] Depression remains prevalent at one year in

longitudinal cohorts, and functional dependence in ADLs affects a substantial proportion of survivors.[21] Family members commonly experience PICS-f, with anxiety predominating and significant impacts on medication use, health stability, and socioeconomic wellbeing.[14][18] Pediatric survivors show measurable functional impairment that can persist for years, and declining PICU mortality increases the number of children living with long-term sequelae.[22][23] Collectively, these epidemiologic findings support a shift toward integrated survivorship care models in which screening, rehabilitation, and family-centered support are treated as essential extensions of critical care rather than optional post-discharge services.[17]

Pathophysiology

Post–Intensive Care Syndrome (PICS) reflects a constellation of persistent impairments that arise after critical illness and ICU exposure, and its pathophysiology is best conceptualized across the three interrelated domains it defines: physical impairment, cognitive impairment, and mental health–related morbidity. Although these domains overlap clinically and can reinforce each other during recovery, each is underpinned by distinct yet sometimes convergent biologic pathways. The ICU environment—characterized by immobilization, systemic inflammation, metabolic instability, hypoxemia, sleep disruption, and exposure to sedatives and analgesics—creates a physiologic "stress landscape" in which tissue injury, neuroinflammation, and dysregulated repair can extend beyond the resolution of the acute illness. Understanding these mechanisms has practical nursing significance because it supports targeted prevention strategies (such as early mobility, delirium prevention, and nutrition optimization) and helps normalize post-ICU symptoms as expected sequelae rather than unexplained failures to recover. The physical domain of PICS is strongly linked to ICU-acquired weakness (ICUAW), which encompasses diffuse weakness due to myopathy, neuropathy, or both. At the cellular level, critical illness is associated with a catabolic state in which skeletal muscle protein breakdown exceeds synthesis. Prolonged immobilization—often unavoidable during mechanical ventilation, hemodynamic instability, or deep sedation—acts as a potent trigger for muscle atrophy. In parallel, the systemic inflammatory response common to sepsis, ARDS, and multiorgan failure releases cytokines and stress hormones that further shift metabolism toward proteolysis. Together, immobilization and inflammatory cytokines activate conserved intracellular degradation programs in skeletal muscle, particularly the ubiquitin–proteasome system and the autophagy–lysosome system, among other pathways. Activation of these systems accelerates breakdown of contractile proteins and structural components, increases overall proteolysis, and perpetuates net catabolism.[24][19] Clinically, these microscopic changes manifest as sarcopenia, reduced muscle cross-sectional area, decreased force generation, and diminished functional reserve—features that explain the characteristic weakness and reduced endurance of ICUAW. Importantly, the consequences are not limited to the limbs. Respiratory musculature, including the diaphragm, may also be affected, contributing to prolonged ventilator dependence, reduced cough effectiveness, secretion retention, and decreased capacity for rehabilitation participation. Thus, the pathophysiology of the physical domain is not simply "deconditioning" in the everyday sense; it reflects a biologically driven, inflammation-amplified acceleration of muscle protein breakdown that can be profound and rapid.

When ICUAW includes a neuropathic component, the pathophysiology extends beyond muscle to involve peripheral nerves and their supporting microcirculation. Neuropathic ICUAW is commonly conceptualized as critical illness polyneuropathy, in which peripheral nerve dysfunction contributes to weakness, reduced reflexes, and sensory abnormalities. One proposed mechanism is microvascular ischemia. In critical illness, endothelial dysfunction, capillary leak, and disordered microcirculatory flow can impair oxygen and substrate delivery to peripheral nerves. This microvascular compromise can disrupt neuronal mitochondrial function, reducing ATP production required for axonal transport and membrane homeostasis, and thereby promoting axonal degeneration and conduction failure. Demyelination has also been implicated, further impairing nerve conduction velocity and signal fidelity.[25] The combined effect is neuromuscular inefficiency: even if muscle fibers remain partially intact, impaired neural input limits coordinated activation and reduces effective strength. This helps explain why some ICU survivors experience disproportionate weakness relative to visible muscle mass loss and why recovery can be prolonged when neuropathic injury is present. Clinically, neuropathic involvement may also worsen functional outcomes because it can impair balance, gait stability, and fine motor control, increasing fall risk and complicating return to self-care activities. The pathophysiology of cognitive impairment in PICS is comparatively less well defined, in part because the brain's response to systemic inflammation and critical illness is complex and influenced by pre-illness vulnerability, acute exposures (such as hypoxemia or hypotension), and ICU-acquired delirium. Nevertheless, several mechanistic themes have emerged. Microglial activation has been implicated as a central feature. Microglia are the brain's resident immune cells, and during systemic inflammation they can become activated through circulating inflammatory mediators, blood–brain barrier alterations, and neuroendocrine stress responses. Once activated,

microglia may produce pro-inflammatory cytokines and reactive oxygen species that contribute to synaptic dysfunction, impaired neuroplasticity, and neuronal injury. Oxidative stress and mitochondrial dysfunction are also proposed contributors, reflecting the brain's high metabolic demand and sensitivity to disruptions in cellular respiration. Inadequate mitochondrial function can impair neuronal energy supply, while oxidative damage can disrupt cellular membranes, proteins, and DNA, thereby impairing signaling and survival pathways.[8] In parallel, activation of apoptotic pathways has been described, suggesting that in some cases critical illness triggers programmed cell death processes that may contribute to longer-term cognitive deficits.[8] These mechanisms provide biologic plausibility for persistent impairments in attention, processing speed, and memory, particularly when ICU delirium or prolonged systemic inflammation occurs.

Neuroinflammation appears to be a particularly important bridge between systemic critical illness and later cognitive decline. Even when the acute infection or shock resolves, inflammatory signaling in the central nervous system may persist or may have initiated longer-lasting changes in neuronal networks. Supporting this concept, higher levels of inflammatory cytokines such as interleukin-6 (IL-6) and interleukin-10 (IL-10) have been associated with decreased cognitive performance up to four years after ICU discharge.[26] While such associations do not prove causality, they are consistent with a model in which inflammatory intensity and duration contribute to long-term cognitive vulnerability. In clinical terms, this suggests that cognitive impairment risk is not purely a consequence of sedation exposure or psychological trauma; it may also be rooted in inflammation-mediated neural injury and dysregulated recovery. This is one reason why survivors of sepsis and ARDS—conditions marked by intense cytokine signaling—appear to experience substantial long-term cognitive burden in epidemiologic studies. The mental health domain of PICS—encompassing depression, anxiety, and PTSD—has a pathophysiology that is both neurobiological and experiential. Although the prompt primarily emphasizes biologic mechanisms, it is important to recognize that psychiatric outcomes after ICU reflect interactions between stress physiology and traumatic exposure. Critical illness activates the hypothalamic–pituitary–adrenal axis and sympathetic nervous system, producing sustained elevations in stress hormones that influence sleep architecture, memory consolidation, and emotional regulation. Sleep fragmentation, common in ICUs due to alarms, interventions, and circadian disruption, can impair emotional processing and increase vulnerability to anxiety and depressive symptoms. Sedation and delirium can fragment memory, and the presence of delusional memories—often experienced as frightening or persecutory—may contribute to intrusive recollections and hyperarousal characteristic of PTSD. Neuroinflammation and oxidative stress, implicated in cognitive dysfunction, may also influence mood pathways through effects on neurotransmitter regulation and neuroplasticity. Consequently, the mental health pathophysiology of PICS likely reflects a convergence of stress-system dysregulation, sleep disturbance, inflammatory signaling, and trauma-related memory processing. These processes can persist after discharge, particularly when social support is limited or when physical disability reinforces helplessness and loss of identity.

From a nursing and interprofessional standpoint, these pathophysiologic insights have practical implications. Recognition that immobilization and cytokine signaling activate the ubiquitin–proteasome and autophagy–lysosome systems provides a biologic rationale for early mobility, minimization of deep sedation when feasible, and aggressive prevention of avoidable bed rest.[24][19] Understanding neuropathic mechanisms such as microvascular ischemia and mitochondrial impairment supports careful hemodynamic optimization, glycemic control, and early identification of neuromuscular weakness patterns that may require specialized rehabilitation.[25] Awareness that microglial activation, oxidative stress, mitochondrial dysfunction, apoptosis, and inflammatory cytokines correlate with long-term cognitive deficits strengthens the rationale for delirium prevention bundles, sleep promotion strategies, and structured post-ICU cognitive screening.[8][26] In this way, PICS pathophysiology is not merely descriptive; it provides a mechanistic foundation for prevention-focused ICU care and continuity planning that extends into survivorship.

History and Physical

A comprehensive history and physical examination are foundational to identifying Post–Intensive Care Syndrome (PICS) and differentiating its manifestations from ongoing acute pathology, preexisting chronic disease, or unrelated new diagnoses. Because PICS encompasses impairments in physical functioning, cognition, and mental health, the clinician's approach should be intentionally structured to capture each domain without assuming that recovery from the precipitating illness equates to restoration of baseline function. Nurses and other providers frequently encounter ICU survivors in follow-up clinics, primary care offices, rehabilitation settings, or during readmissions; therefore, it is essential to use a systematic method that both screens for common sequelae and establishes the degree of change from pre-ICU status. A major challenge is that patients may underreport symptoms due to normalization of disability, fragmented recall of illness, or limited insight in the presence of cognitive

deficits. For this reason, obtaining collateral information from caregivers or family members is often indispensable, particularly when memory, attention, or executive function remain impaired. When eliciting the history, providers should specifically target the three domains of PICS. Physical history should explore weakness, fatigue, dyspnea with exertion, pain, and functional limitations. Questions should assess mobility and endurance in practical terms—such as the ability to rise from a chair, climb stairs, walk a defined distance, or carry household items—because these reflect real-world consequences of ICU-acquired weakness and deconditioning. Inquiry into swallowing difficulty, voice changes, cough effectiveness, and breathlessness is important because respiratory muscle weakness, laryngeal injury, or dysphagia after prolonged intubation can persist and may contribute to aspiration risk and malnutrition. A careful medication review should accompany the functional history, as sedatives, opioids, anticholinergic agents, and some psychotropic medications can worsen fatigue, impair cognition, and increase fall risk. Sleep quality should be assessed explicitly because insomnia and circadian disruption are common after ICU discharge and can amplify both cognitive symptoms and mood disturbance.

Cognitive history should assess memory, attention, processing speed, and executive function in ways that connect directly to everyday function. Patients may describe forgetfulness, difficulty concentrating, slowed thinking, or trouble performing tasks that were previously automatic. Importantly, cognitive impairment often becomes most apparent when patients attempt to resume complex activities such as driving, medication self-management, finances, or employment responsibilities. Therefore, questions about return to work, the ability to manage appointments, and handling of personal affairs provide practical indicators of executive function. Because cognitive deficits can reduce insight, caregiver input can clarify changes in organization, judgment, and safety behaviors. In parallel, mental health history should address anxiety, depressive symptoms, irritability, emotional lability, anhedonia, and trauma-related symptoms such as nightmares, intrusive recollections, hypervigilance, or avoidance of reminders of the ICU experience. Screening for mood and trauma symptoms is crucial because these conditions are common and frequently coexist with physical disability, and because untreated psychiatric symptoms can substantially reduce engagement with rehabilitation and follow-up care. To structure this multidimensional history and to anchor it to baseline, some researchers have proposed the concept of "functional reconciliation," modeled after the widely used process of medication reconciliation. Functional reconciliation aims to compare the patient's current functional status with their pre-ICU baseline to quantify the degree of decline, identify priorities for rehabilitation, and detect unmet care needs. This approach emphasizes assessment of activities of daily living (ADLs), exercise tolerance, mood, and cognitive function markers, including return-to-work status and the ability to manage one's affairs.[27] Operationally, functional reconciliation can be implemented as a guided interview that addresses both basic ADLs—such as bathing, dressing, toileting, transferring, continence, and feeding—and instrumental ADLs, including cooking, shopping, managing medications, handling finances, using transportation, and communicating effectively. In nursing practice, this framework is particularly useful because it converts abstract symptom reporting into tangible measures of independence and care burden, facilitating appropriate referral to physical therapy, occupational therapy, speech-language pathology, or mental health services. It also supports caregiver assessment by identifying where informal support is being used and where formal services may be required.

Following the history, a full physical examination is essential, including assessment of vital signs, because the medical condition of ICU survivors may remain clinically fragile. Persistent tachycardia, hypotension, hypoxemia, fever, or orthostatic changes may indicate ongoing cardiopulmonary instability, infection, dehydration, or autonomic dysfunction. Beyond vital signs, general appearance can provide immediate clues to nutritional status and functional capacity. Bitemporal wasting may indicate sarcopenia and catabolic muscle loss, consistent with ICU-acquired weakness and poor nutritional recovery. Poor hygiene, unkempt clothing, or lack of grooming may suggest limited independence in ADLs, depression, or cognitive impairment affecting self-care. Weight changes and signs of dehydration—dry mucous membranes, poor skin turgor, or postural dizziness—should be noted because inadequate oral intake is common when fatigue, dysphagia, or depression persists. The physical exam should include careful cardiopulmonary evaluation to identify residual organ dysfunction, such as heart failure signs, abnormal lung sounds suggesting atelectasis or fibrosis, and oxygen saturation changes with ambulation. A focused musculoskeletal exam can assess muscle bulk, tone, joint range of motion, and functional strength. Simple bedside maneuvers—such as sit-to-stand testing, grip strength assessment, or observation of gait—can provide meaningful indicators of weakness and fall risk. Because ICU-acquired weakness frequently includes neuropathic and myopathic components, the neurologic exam warrants particular attention. Providers should assess muscle strength symmetrically, evaluate deep tendon reflexes, test sensation, and examine coordination. Reduced reflexes, distal sensory loss, or marked symmetric weakness may suggest critical illness

polyneuropathy, whereas proximal weakness with preserved sensation may be more consistent with myopathy. Observation for tremor, rigidity, or other movement abnormalities may help detect neurologic comorbidities that emerged or were unmasked during critical illness. Cranial nerve assessment can be important when dysphagia, dysphonia, or facial weakness is present, particularly after prolonged intubation or critical illness neuropathy.

Mental health assessment begins in the history but should also be integrated into the physical encounter. The evaluation is incomplete without observing the patient's affect, eye contact, psychomotor activity, and body language. Flat affect, slowed speech, poor engagement, or tearfulness may indicate depression, while restlessness, guardedness, or exaggerated startle may suggest anxiety or PTSD. Because psychological symptoms can be stigmatized or minimized, empathetic but direct questioning about fear, mood, and distressing memories is often necessary to elicit clinically meaningful information. When risk factors are present, providers should also assess for substance use as a maladaptive coping strategy, given that some patients may increase alcohol or sedative use after traumatic hospitalization. A limited cognitive assessment should be performed as part of post-ICU evaluation to screen for deficits that may require further investigation. Tools such as the Mini-Mental Status Exam can provide a structured snapshot of orientation, recall, attention, and language, and can identify patients who warrant more comprehensive neurocognitive testing. If screening suggests impairment, referral for formal assessment is important to characterize domains affected, determine severity, and guide targeted rehabilitation and safety planning. Cognitive impairment also influences informed consent, medication adherence, and driving safety, making timely identification clinically significant. In many settings, nurses contribute directly by administering screening tools, documenting functional observations, and ensuring that caregiver concerns are formally captured in the health record. Overall, the history and physical examination after critical illness should be deliberately multidomain, incorporating functional reconciliation to anchor assessment to pre-ICU baseline, and integrating caregiver input to compensate for potential cognitive limitations.[27] A full physical exam with vital signs remains essential because post-ICU patients may have tenuous physiologic stability. Careful observation of appearance, hygiene, affect, and neurologic function can reveal hidden impairments, while bedside cognitive screening can direct appropriate referral for comprehensive testing. This systematic approach enables early recognition of PICS, supports timely rehabilitation planning, and provides a clinically grounded pathway toward restoring independence and quality of life.

Evaluation

Evaluation of Post–Intensive Care Syndrome (PICS) requires a deliberate, systems-aware approach because the syndrome is defined by impairments that emerge or persist after ICU discharge, often outside of the acute-care environment where the precipitating illness was treated. In practice, identifying PICS can be difficult not because its manifestations are rare, but because they are frequently fragmented across settings and interpreted as nonspecific "post-hospital" symptoms rather than a coherent syndrome. One of the most significant barriers is limited continuity of care between the ICU, step-down units, rehabilitation or nursing facilities, and the home environment.[1] During these transitions, clinical priorities often shift toward immediate medical stability and discharge logistics, while long-term functional, cognitive, and psychological outcomes may receive less systematic assessment. Patients may be discharged with complex medication regimens, reduced mobility, fatigue, and sleep disturbance, yet without structured follow-up focused on multidomain recovery. Additionally, caregivers may not know which symptoms are expected, which are concerning, and which warrant urgent evaluation. As a result, PICS may be underrecognized, undertreated, and misattributed to aging, comorbidity progression, or simple deconditioning. Health system structure strongly influences where PICS evaluation occurs. While specific post-ICU clinics are relatively common in the United Kingdom's National Health Service, similar programs are less prevalent in the United States.[28] Consequently, in many U.S. contexts, PICS is most often evaluated in primary care or general outpatient settings rather than in specialized recovery clinics.[28] This reality has important implications: primary care clinicians, community nurses, and outpatient providers must be prepared to recognize the hallmarks of PICS even when they do not have detailed familiarity with the patient's ICU course or access to standardized ICU recovery pathways. Because PICS spans physical, cognitive, and mental health domains, evaluation must move beyond a single-complaint model and instead employ structured screening across multiple functional systems. Without this multidomain lens, clinicians may treat isolated symptoms (such as insomnia or fatigue) without identifying the broader syndrome, missing opportunities for coordinated rehabilitation and mental health intervention.

One widely cited model of structured PICS evaluation is Vanderbilt University's post-ICU clinic, the ICU Recovery Center, established in 2012 specifically to identify and treat PICS.[29] Although such a model may not be feasible in all settings due to resource constraints, staffing limitations, and

geographic access barriers, its assessment framework illustrates how PICS evaluation can be organized and replicable. The center's first visit typically occurs two weeks after hospital discharge, a timing that recognizes the early post-discharge period as a high-risk window when impairments are clinically evident and interventions may be most effective. The visit includes spirometry and a six-minute walk test to assess physical impairment, screening for mental health problems, and a brief cognitive assessment using instruments such as the Montreal Cognitive Assessment or the Mini-Mental State Examination.[29] This combination of tests is instructive because it translates the PICS domains into measurable clinical indicators: spirometry and walking distance capture physiologic reserve and functional endurance; mental health screening detects anxiety, depression, and trauma-related symptoms; and cognitive screening provides an early signal of deficits that could compromise medication management, safety, or return to work. Importantly, the clinic also incorporates a review of the patient's ICU course so that the patient's recollection of events can be reconciled with an objective timeline.[29] This reconciliation serves multiple purposes: it may reduce confusion driven by delirium-related memories, help normalize frightening experiences, and provide a coherent narrative that can mitigate trauma processing difficulties. From a nursing perspective, facilitating this "story integration" is often therapeutic, particularly for patients who recall vivid hallucinations or fragmented, distressing memories. The Vanderbilt team has also highlighted limitations that are highly relevant to real-world implementation. Loss to follow-up and appointment no-shows can significantly reduce clinic effectiveness.[29] These barriers are not trivial; they reflect the practical realities of ICU survivorship. Many patients struggle with mobility, lack transportation, depend on working family members for travel support, or experience fatigue and cognitive impairment that makes planning difficult. Social determinants such as income, caregiving availability, and health literacy can therefore directly influence who receives post-ICU evaluation and who does not, potentially widening inequities in recovery outcomes. For this reason, evaluation models must be adaptable to remote delivery and must minimize logistical burdens to be broadly effective.

To support detection of PICS in outpatient environments, several groups have developed screening questionnaires.[30][31] A major advantage of such tools is that they can be administered without requiring in-person visits, which is critical because transportation to outpatient clinics is often a major obstacle for recovering ICU patients. These questionnaires can be delivered by phone, mail, or digital platforms and can provide structured insight into functional status, mood symptoms, sleep quality, and cognitive complaints. Their usefulness is amplified when they are integrated into routine primary care workflows, enabling clinicians to identify high-risk patients early and to triage them toward appropriate services such as physiotherapy, occupational therapy, neurocognitive evaluation, or psychiatric care. Screening tools also help standardize assessment across providers, reducing variability that can occur when clinicians focus only on the symptom that is most salient during a brief office encounter. Remote evaluation approaches have gained additional relevance through telemedicine. Some authors have reported success using telemedicine to evaluate patients for PICS symptoms at a distance.[32] Telemedicine is particularly well suited to PICS evaluation because many key elements—history focused on ADLs and exercise tolerance, depression and anxiety screening, caregiver interviews, medication review, and certain cognitive screening tasks—can be conducted effectively through video or phone. Telemedicine also supports caregiver involvement, as family members can more easily join remote visits than in-person appointments. For nursing-led follow-up, telehealth can allow repeated check-ins, reinforcement of rehabilitation plans, and early identification of warning signs such as worsening dyspnea, escalating anxiety, or medication mismanagement. While telemedicine cannot fully replace physical performance testing or detailed neuropsychological evaluation, it can function as a powerful triage and monitoring tool that reduces attrition and expands access.

Nonetheless, comprehensive PICS evaluation often requires a hybrid model that combines remote screening with targeted in-person testing. Certain diagnostic procedures cannot be performed remotely and are necessary to clarify the pathophysiology underlying persistent impairment. For example, when generalized weakness persists, electromyography (EMG) and nerve conduction studies can help distinguish myopathy from neuropathy, which is clinically meaningful because the rehabilitation approaches for these conditions differ.[3] Myopathic weakness may emphasize progressive resistance training and muscle endurance strategies, whereas neuropathic weakness may require interventions tailored to sensory loss, balance impairment, gait training, and compensatory safety strategies. Accurate distinction also informs prognosis and helps set realistic recovery expectations for patients and families. In settings where formal neurocognitive deficits are suspected, comprehensive neuropsychological testing may be required to identify specific domains affected and to guide cognitive rehabilitation and workplace accommodations. Similarly, persistent respiratory complaints may warrant pulmonary function testing beyond basic spirometry, imaging, or cardiopulmonary exercise testing when clinically indicated. A pragmatic evaluation strategy for PICS,

therefore, begins with structured screening across domains and proceeds to targeted diagnostic clarification based on the initial findings. In many health systems—particularly those without dedicated post-ICU clinics—primary care is the front line for this process.[28] This makes awareness and education essential: clinicians who see ICU survivors must recognize that persistent weakness, cognitive "fog," insomnia, anxiety, and depressed mood can represent predictable sequelae of critical illness and warrant coordinated evaluation rather than fragmented symptom-by-symptom management. A structured framework can include baseline functional reconciliation (comparison of pre-ICU and post-ICU ADLs), physical performance screening (for example, six-minute walk testing when feasible), cognitive screening (MoCA or similar tools), and validated mental health screening instruments. The evaluation should also include caregiver input to compensate for limited patient insight, as well as a review of the ICU course when available, because factors such as delirium duration, mechanical ventilation, sepsis, and prolonged immobilization can inform risk stratification and guide anticipatory counseling.

Ultimately, the evaluation of PICS is both a clinical and a systems challenge. The syndrome's high prevalence, multidomain nature, and post-discharge onset demand structured screening and coordinated follow-up across care transitions.[1] Specialized post-ICU clinics, such as Vanderbilt's ICU Recovery Center, provide an effective model of early, multidomain assessment incorporating physical testing, mental health screening, cognitive evaluation, and reconciliation of the ICU narrative, but are limited by access barriers and follow-up attrition.[29] Screening questionnaires and telemedicine approaches offer scalable methods to reach patients who cannot attend in-person visits and can serve as effective tools for early identification and triage.[30][31][32] When impairment is detected, targeted in-person diagnostics—such as EMG and nerve conduction studies—remain important for refining diagnosis and tailoring rehabilitation strategies.[3] In this way, a high-quality PICS evaluation pathway is best viewed as a continuum: remote or primary care screening to detect risk and impairment, followed by specialized assessment and multidisciplinary intervention tailored to the specific domains affected.

Treatment / Management

Treatment and management of Post–Intensive Care Syndrome (PICS) must be understood within an important clinical reality: once PICS has developed, interventions to reverse it are often only partially effective, and improvements may be slow, heterogeneous, and limited by biological injury, social constraints, and gaps in follow-up. In other words, survivorship care is necessary but frequently insufficient to fully restore premorbid function. This limitation has been reflected in evidence evaluating formal ICU follow-up services. A Cochrane Review assessing the impact of ICU follow-up services reported limited effectiveness in improving health-related quality of life (HRQoL).[33] While this finding should not be interpreted as an argument against post-ICU clinics—since they may provide benefits not captured fully by HRQoL measures, such as symptom validation, care coordination, and targeted referrals—it does underscore a key principle: the most effective "treatment" for PICS is prevention initiated during the ICU stay, before the downstream impairments become biologically entrenched and behaviorally reinforced. Prevention-focused management begins in the ICU and requires a structured approach to sedation, ventilator liberation, delirium mitigation, mobilization, and family-centered care. The ABCDEF bundle has emerged as a widely endorsed, evidence-based framework to reduce the risk and severity of PICS across its physical, cognitive, and psychological domains. It has been implemented in numerous institutions, including broad adoption across major hospitals in the United States through the ICU Liberation Collaboration.[34] The ABCDEF framework is not a single intervention; it is a coordinated set of practices designed to address core drivers of post-ICU morbidity, including prolonged immobilization, excessive sedation, delirium, and fragmented communication. Because PICS is multidomain, preventive strategies must also be multidomain and synchronized across disciplines, with nursing leadership often serving as the operational backbone of consistent bundle delivery. The first component, "A," focuses on the assessment, prevention, and management of pain. Pain in ICU patients is common due to invasive devices, procedures, immobility, and underlying disease. Uncontrolled pain contributes to sympathetic activation, sleep disruption, agitation, and ventilator dyssynchrony, and it often prompts escalation of sedatives, which can then increase delirium risk. Systematic pain assessment—using validated tools appropriate for intubated and nonverbal patients—and prompt analgesia can reduce the need for deep sedation and facilitate participation in mobility and breathing trials. From a nursing standpoint, consistent pain assessment and titrated analgesia are pivotal because nurses are positioned to detect pain behaviors, evaluate physiologic responses, and adjust therapy in real time while balancing hemodynamic stability and respiratory drive.

"B" encompasses both spontaneous breathing trials (SBTs) and spontaneous awakening trials (SATs). These paired practices support daily evaluation of readiness to reduce ventilator support and to lighten sedation, thereby reducing the duration of mechanical ventilation and the cumulative

exposure to sedative agents. Prolonged mechanical ventilation is strongly associated with muscle deconditioning, diaphragmatic weakness, and longer ICU stays, all of which contribute to the physical domain of PICS. Likewise, prolonged deep sedation increases delirium risk and can distort memories of the ICU experience, contributing to later cognitive and psychological sequelae. Coordinated SAT–SBT protocols require interdisciplinary synchronization among bedside nurses, respiratory therapists, and physicians, with close monitoring for safety indicators such as oxygenation, hemodynamic stability, and agitation. Successful implementation depends on clear communication and shared criteria for trial initiation and termination, emphasizing that PICS prevention is fundamentally a team process. "C" refers to the choice of sedation and analgesia, with an emphasis on maintaining relatively light sedation and avoiding benzodiazepines where possible. Light sedation supports earlier mobilization, preserves circadian cues, enables communication, and reduces delirium risk, thereby addressing both the cognitive and psychological components of PICS. Benzodiazepines have been associated with delirium risk in many ICU populations, and avoidance strategies often prioritize alternative agents and analgesia-first approaches. Sedation strategies are not simply pharmacologic; they require continuous reassessment of goals, regular titration, and frequent evaluation of patient comfort and safety. Nursing practice is central here because sedation depth is often managed at the bedside, and nurses are responsible for balancing comfort, ventilator synchrony, safety, and participation in rehabilitation-related activities. "D" emphasizes delirium assessment, prevention, and management. Delirium is a form of acute brain dysfunction and is a major risk factor for longer-term cognitive impairment in ICU survivors. Routine delirium screening using validated tools allows early identification and supports targeted interventions, including optimization of sleep, reduction of unnecessary sedatives, pain control, mobilization, correction of metabolic derangements, and reorientation strategies. Delirium prevention also depends on environmental and human factors: minimizing nighttime disruptions, ensuring sensory aids (glasses, hearing aids), promoting day–night cues, and reducing restraint use when feasible. Because delirium can be frightening and may contribute to later trauma symptoms, addressing delirium also supports prevention of psychological sequelae by reducing the intensity and duration of frightening perceptual experiences.

"E" focuses on early mobility and exercise, which directly targets the physical domain of PICS by countering immobilization-related sarcopenia and ICU-acquired weakness. Early mobility may include passive range-of-motion exercises, sitting at the edge of the bed, transferring to a chair, standing, and ambulation as tolerated, guided by safety criteria such as oxygenation, hemodynamics, and device management. Early mobility is not simply a physiotherapy activity; it is a culture of care requiring sedation minimization, device planning, and nursing engagement to coordinate timing and ensure safety. Mobilization also has cognitive and psychological benefits by improving sleep–wake cycles, enhancing orientation, and restoring a sense of agency—factors that may mitigate delirium and distress [35]. "F" highlights family engagement and empowerment, acknowledging that the ICU experience affects both patients and their families and that family presence can improve communication, reduce distress, and support recovery. Family engagement can include involvement in goal setting, provision of orientation cues, participation in reconditioning encouragement, and inclusion in discussions that align care with patient values. Importantly, family engagement is also a prevention strategy for PICS-f, the family-centered counterpart syndrome characterized by anxiety, depression, and trauma symptoms in relatives of ICU patients. While the ABCDEF bundle provides a foundational prevention framework, additional interventions specifically targeting psychological outcomes have shown promise. One well-studied approach is the use of ICU diaries—chronological narratives of the ICU stay that may include photographs and are shared with survivors and their families during and after hospitalization. ICU patients often retain limited, fragmented, or distorted memories due to sedation and delirium. Diaries can help reconcile frightening or delusional memories with an accurate timeline, provide context for the patient's progression, and support meaning-making in recovery. A meta-analysis found that ICU diaries were associated with decreased incidence of depression and anxiety in ICU survivors, along with improved HRQoL scores. Diaries were also associated with reduced PTSD risk in family members, although the evidence for this family benefit was less robust [35]. Clinically, diaries can function as a therapeutic bridge between the ICU experience and post-discharge recovery, supporting both cognitive reorientation and emotional processing.

Communication practices between ICU teams and families also play a central role in preventing or mitigating PICS-f. High-quality communication can reduce uncertainty, improve trust, and lessen the sense of helplessness that often drives anxiety and complicated grief. Strategies include regularly scheduled family conferences, empathic listening, minimizing medical jargon, and ensuring consistent messaging across disciplines. Involvement of social workers, psychotherapists, and clergy members can provide tailored support for families facing distress, moral injury, or complex decision-making.[18] Importantly, communication is not merely informational; it is relational. Families often require acknowledgment of emotions, guidance on

what to expect, and support in coping with the ambiguity that critical illness creates. Beyond conventional communication models, emerging approaches have explored structured family participation in ICU care experiences. A recent study reported decreased rates of PTSD in family members who participated in a novel strategy that included direct participation in bedside care rituals for the ICU patient.[36] While the generalizability of such interventions may depend on institutional policies, infection control considerations, and cultural norms, the finding is consistent with a broader concept: active, supported involvement may reduce helplessness and facilitate adaptive coping. This also aligns with the ABCDEF principle of family empowerment by framing relatives as partners rather than passive observers of high-stakes medical events. After discharge, management shifts toward rehabilitation, symptom monitoring, and supportive care, even if evidence suggests that post-ICU services produce only modest gains in HRQoL at a population level.[33] In practice, post-ICU management still matters because it provides a structure for early detection of persistent weakness, cognitive deficits, and mental health symptoms; it supports timely referral to physiotherapy, occupational therapy, speech-language pathology, neuropsychology, or psychiatry; and it helps coordinate complex medication regimens and comorbidity management. However, given the limited continuity between ICU and outpatient settings, the greatest impact may be achieved by integrating preventive bundles during ICU care and ensuring that discharge planning includes explicit survivorship education, caregiver support, and follow-up pathways. In this model, nursing leadership is critical: nurses operationalize pain and sedation protocols, perform delirium screening, coordinate mobility, educate families, and often serve as the primary communicators who translate ICU events into understandable narratives for patients and families [35]. In summary, the management of PICS requires recognition that post-ICU clinics and follow-up services may offer only limited improvements in global HRQoL metrics,[33] reinforcing prevention as the most effective strategy. The ABCDEF bundle addresses the principal drivers of physical, cognitive, and psychological impairment and is increasingly implemented through national initiatives [35]. Complementary interventions such as ICU diaries and high-quality family communication strategies provide additional mechanisms to reduce anxiety, depression, and trauma-related outcomes in patients and relatives.[35] [18][36] Collectively, these approaches emphasize that preventing PICS is not a single clinical action but an integrated care philosophy sustained by interprofessional collaboration and vigilant nursing practice from the ICU through recovery.

Differential Diagnosis

Post–Intensive Care Syndrome (PICS) is best understood as a multidomain survivorship syndrome rather than a single discrete disease, and this breadth is precisely what makes its differential diagnosis clinically demanding. ICU survivors often present with persistent weakness, fatigue, cognitive complaints, sleep disturbance, anxiety, depression, and trauma-related symptoms—features that overlap with a wide range of neurologic, endocrine, nutritional, cardiopulmonary, and psychiatric conditions. Moreover, many ICU survivors are older adults with multiple comorbidities, making it essential to determine whether post-discharge impairment represents a new syndrome attributable to critical illness, progression of preexisting disease, a complication of ICU care, or an unrelated emerging pathology. A careful differential diagnosis is therefore necessary not to "exclude PICS," but to ensure that reversible or high-stakes alternative conditions are not missed and that coexisting diagnoses are appropriately treated alongside PICS-focused rehabilitation. The physical domain of PICS, frequently driven by ICU-acquired weakness, must be differentiated from other causes of weakness or neurologic deficit. Acute or subacute cerebrovascular events, including ischemic stroke or intracerebral hemorrhage, may present with weakness after hospitalization and can be mistakenly attributed to deconditioning or myopathy if focal findings are subtle. A focused neurologic history and exam is therefore essential, paying attention to asymmetry, speech or language disturbance, visual field deficits, facial droop, and unilateral coordination abnormalities. Disorders of the spine must also be considered, particularly when weakness is accompanied by sensory level changes, bowel or bladder dysfunction, radicular pain, or progressive gait instability. Cervical myelopathy, spinal cord infarction, compressive lesions, or epidural abscess may produce motor and sensory deficits that require urgent evaluation. Similarly, peripheral nerve injuries related to ICU positioning, prolonged prone ventilation, or compression from devices can cause focal neuropathies that differ from the diffuse, symmetric pattern typical of ICU-acquired weakness. Distinguishing diffuse symmetric weakness from focal neurologic injury has practical consequences because focal lesions may require urgent imaging, targeted interventions, and specific rehabilitation plans.

Even when weakness appears generalized, clinicians must consider systemic contributors that can mimic or exacerbate PICS-related physical impairment. Electrolyte abnormalities—such as hypokalemia, hypophosphatemia, hypomagnesemia, or disturbances in calcium—can produce weakness, cramps, paresthesia, or even paralysis, and may fluctuate in the post-discharge period due to diuretic use, poor nutrition, diarrhea, or renal dysfunction.

Endocrine disorders should also be evaluated when clinically indicated. Hypothyroidism can cause fatigue, myalgias, bradycardia, and cognitive slowing; adrenal insufficiency can produce profound weakness, hypotension, and weight loss; poorly controlled diabetes can contribute to neuropathy and fatigue; and hypogonadism or other hormonal dysregulation may influence mood and energy. Nutritional deficiencies are particularly important because many ICU survivors have reduced intake from anorexia, dysphagia, altered taste, depression, or socioeconomic barriers. Deficiencies in vitamin B12, folate, iron, thiamine, or vitamin D can contribute to fatigue, neuropathy, myopathy, and cognitive complaints. In practice, PICS often coexists with these deficiencies rather than replacing them; therefore, evaluation should include identification and correction of reversible metabolic contributors to improve rehabilitation potential. Cognitive impairment in PICS presents another complex diagnostic overlap. Post-ICU cognitive deficits often involve attention, processing speed, and executive function more prominently than isolated memory encoding, though patients may report "forgetfulness" as a global complaint. This profile must be differentiated from progressive dementias, delirium recurrence, medication effects, and depression-related cognitive impairment. In older adults, there may be real overlap between PICS-related cognitive impairment and underlying neurodegenerative disease. However, distinguishing features can guide clinical reasoning. Many dementias, including Alzheimer's disease, typically follow a progressive trajectory over time, with increasing impairment in memory consolidation and functional decline. Cognitive impairments associated with PICS, in contrast, tend to be more stable and may gradually improve, particularly over months after discharge, although persistence is possible. Additionally, memory deficits are often less pronounced in PICS than in Alzheimer-type dementia, while impairments in attention and processing speed may be more prominent. These differences are not absolute and do not eliminate the possibility of coexistence, but they provide a conceptual framework: a stable or improving cognitive trajectory after ICU, dominated by attention and executive dysfunction, supports PICS; a steadily progressive decline dominated by episodic memory loss and worsening independent function raises suspicion for neurodegenerative dementia. Medication review is critical in this context because sedatives, anticholinergics, opioids, and some anticonvulsants can impair attention and memory, potentially mimicking cognitive decline. Sleep disorders—including insomnia and obstructive sleep apnea—can also cause cognitive fog and must be assessed because they are treatable and common after critical illness.

A particularly important diagnostic pitfall is the overlap between cognitive impairment and severe depression. Depression is a recognized component of PICS, but it can also masquerade as cognitive decline, producing prominent deficits in attention, concentration, and executive function—sometimes termed "pseudodementia" in clinical descriptions. Patients may report poor memory, slowed thinking, and inability to focus, yet formal testing may reveal variability linked to motivation and mood rather than irreversible cognitive injury. Distinguishing depression-driven cognitive symptoms from primary cognitive impairment is essential because the former is often responsive to antidepressant pharmacotherapy, psychotherapy, sleep optimization, and structured behavioral activation, whereas primary cognitive deficits may require cognitive rehabilitation, compensatory strategies, and environmental supports. Clinically, clues that depression is a major driver include pervasive anhedonia, guilt, sleep and appetite changes, psychomotor slowing, and a cognitive complaint pattern that fluctuates with mood severity. Conversely, patients with primary cognitive impairment may minimize deficits, while caregivers report safety concerns and functional errors. In many ICU survivors, both processes coexist: mild cognitive impairment can increase frustration and hopelessness, while depression can further reduce cognitive efficiency. Therefore, evaluation should not force an either–or conclusion when combined pathology is plausible; instead, it should identify treatable mood disorders while still screening for persistent cognitive deficits. The mental health manifestations of PICS and PICS-f similarly overlap with a wide range of psychiatric diagnoses and trauma-related conditions. Anxiety, depression, and PTSD symptoms after ICU may represent new-onset disorders triggered by the ICU experience, an exacerbation of preexisting psychiatric illness, or a manifestation of broader psychosocial stressors such as financial strain, relationship disruption, or caregiver burnout. In family members, PICS-f symptoms can resemble adjustment disorder, generalized anxiety disorder, major depressive disorder, or prolonged grief disorder, depending on the clinical context and whether the ICU course included end-of-life decision-making or death. Because these syndromes may occur in individuals with longstanding psychiatric histories, clinicians must consider baseline mental health status, prior trauma exposure, and ongoing psychosocial supports when interpreting symptoms. However, it is equally important not to attribute all post-ICU psychological distress solely to the ICU experience without considering organic contributors. Thyroid dysfunction, anemia, medication adverse effects, sleep disorders, substance withdrawal, and cardiopulmonary disease can present with anxiety-like symptoms such as palpitations, dyspnea, irritability, and insomnia. In both patients and family members, new substance misuse may develop as a maladaptive coping response, and this

can worsen anxiety, sleep quality, and depression while complicating treatment plans.

In practical terms, the differential diagnosis of PICS requires an approach that is simultaneously broad and prioritized. High-risk, time-sensitive neurologic conditions—such as stroke or spinal cord pathology—must be excluded when focal deficits or red flags are present. Metabolic and nutritional contributors should be evaluated and corrected because they are common, reversible, and can substantially influence recovery. Cognitive decline must be contextualized within trajectory and neuropsychological profile, recognizing that PICS-related deficits may be stable or improving and often emphasize attention and processing speed, yet may overlap with dementia in elderly populations. Depression should be assessed carefully because severe depression can mimic cognitive impairment and is treatable, and because addressing mood can unlock progress in physical and cognitive rehabilitation. Finally, PICS-f and patient mental health symptoms should be evaluated with attention to preexisting psychiatric illness while also considering medical and organic contributors, ensuring that distress is neither dismissed as "expected" nor misattributed without adequate assessment. Through this multidomain differential process, clinicians can diagnose PICS when appropriate while still identifying comorbid or alternative conditions that require specific treatment, thereby optimizing recovery outcomes for both survivors and their families.

Prognosis

The prognosis of Post–Intensive Care Syndrome (PICS) is heterogeneous and depends on an interplay of pre-illness health status, the severity and duration of the critical illness, cumulative ICU exposures, and the degree of impairment present at hospital discharge. In clinical terms, prognosis is strongly shaped by physiologic reserve and baseline function: patients who were independent, physically active, and cognitively intact prior to ICU admission generally demonstrate greater recovery capacity than those with frailty, multimorbidity, or preexisting cognitive vulnerability. The trajectory is also influenced by post-discharge resources, including timely access to rehabilitation services, caregiver support, health literacy, and continuity of follow-up. Because PICS encompasses physical, cognitive, and mental health domains, prognostication should be multidimensional; improvement in one domain does not necessarily imply parallel recovery in the others, and persistent deficits in cognition or mood may limit functional gains even when muscle strength improves. Across many cohorts, physical impairment tends to be the most amenable to measurable improvement over time, particularly when structured physiotherapy and occupational therapy are initiated early and sustained through the recovery period. This relative responsiveness likely reflects the partial reversibility of muscle deconditioning and some components of ICU-acquired weakness through progressive mobilization, resistance training, and functional retraining. In contrast, cognitive and mental health sequelae often demonstrate greater persistence, in part because they may reflect more complex neurobiological and psychosocial processes, including delirium-related brain injury, sustained neuroinflammation, sleep disruption, and trauma-related memory processing. The multicenter study by Marra and colleagues, which evaluated 406 U.S. ICU survivors at 3 and 12 months post-discharge, illustrates this differential trajectory. Physical impairment improved from 23% at 3 months to 17% at 12 months, whereas improvements in the cognitive and mental health domains were more limited, with approximately one-third of survivors experiencing deficits at both follow-up points.[20] These findings support a prognostic pattern in which rehabilitation yields incremental physical gains over time, while cognitive and psychological problems may persist and require more prolonged, targeted interventions.

Longer-term follow-up studies reinforce that cognitive outcomes can remain impaired years after ICU discharge in a clinically meaningful subset of survivors. Cognitive deficits have been reported in approximately one-quarter of ARDS survivors even six years after discharge, and similarly high rates of persistent cognitive impairment have been observed among sepsis survivors.[18] Importantly, although the magnitude of post-ICU cognitive impairment can resemble that seen in neurodegenerative conditions such as Alzheimer disease, the clinical course differs. ICU-acquired cognitive deficits are typically nonprogressive and may stabilize or gradually improve, rather than demonstrating the inexorable decline characteristic of many dementias.[8] This distinction has practical prognostic implications: patients and families should be counseled that recovery may be slow and incomplete, yet it is not necessarily characterized by relentless deterioration. Nonetheless, persistent executive dysfunction and reduced processing speed can continue to impair medication management, driving safety, employability, and independent living, warranting ongoing supports and formal assessment when deficits are suspected. Prognosis in pediatric ICU survivors remains less precisely defined, but available evidence suggests that both the rate and persistence of impairments may be broadly comparable to adult patterns.[37] Pediatric trajectories are additionally complicated by developmental considerations, because an apparent "recovery" to baseline functioning may still entail subtle deficits that emerge later as cognitive and social demands increase. Finally, PICS-f is common among close family members of ICU patients, but symptoms often attenuate naturally over time and can

be further improved with psychotherapy and, when indicated, pharmacotherapy.[14] In aggregate, prognosis in PICS is best framed as a dynamic recovery process with variable domain-specific trajectories, emphasizing early recognition, individualized rehabilitation planning, and sustained follow-up to maximize long-term function and quality of life.

Complications

The complications of PICS extend beyond clinical symptoms to include durable socioeconomic and relational consequences that can reshape the lives of survivors and families. Functional limitations may persist long after discharge, reducing independence and increasing reliance on informal caregivers, most commonly family members. This reliance has downstream effects on household productivity, caregiver wellbeing, and access to healthcare, creating a compounding cycle in which disability, caregiver burden, and financial stress reinforce each other. In this sense, PICS is not merely a post-ICU medical syndrome; it is also a driver of long-term social vulnerability, with consequences that may persist even when physiologic stability is restored. Evidence from population-based surveys highlights the magnitude of ongoing care needs and the extent to which caregiving often falls outside formal healthcare systems. A study of ICU survivors in the United Kingdom found that one year after discharge, 22% still required assistance with daily care, and this support was usually provided by unpaid family members.[38] The same cohort reported substantial financial impacts: 28% described a negative effect on family income attributable to the ICU stay and the prolonged recovery period.[38] These data illustrate how functional dependency translates directly into economic consequences, particularly when caregiving reduces working hours or requires job modification. Similar patterns have been observed in U.S. settings. A survey conducted in the United States reported employment reduction affecting approximately 50% of ICU survivors, with about half of those individuals becoming newly unemployed.[39] Loss of employment is not simply a financial complication; it often also worsens mental health through diminished purpose, social isolation, and reduced access to employer-sponsored insurance, potentially increasing barriers to rehabilitation and follow-up services.

Family members are likewise affected, particularly when PICS-f develops. Psychological distress in caregivers can reduce their capacity to provide sustained, effective support, even as survivors continue to require assistance with mobility, self-care, and medical management. Family members experiencing anxiety, depression, or trauma-related symptoms may have diminished resilience, impaired sleep, reduced concentration, and increased irritability, all of which can compromise caregiving quality and increase household conflict. Importantly, caregiver mental health problems may also contribute to reduced labor force participation, thereby amplifying economic strain at the household level. The cumulative effect is a bidirectional complication: survivor disability increases caregiver burden, while caregiver psychological impairment reduces the capacity to support the survivor, increasing the risk of delayed recovery, readmissions, and chronic dependency.[40] In pediatric populations, the complications of PICS-p can be particularly disruptive because impairments occur during critical windows of cognitive, emotional, and social development. Persistent weakness, fatigue, attention deficits, or emotional dysregulation can interfere with school participation, peer relationships, and developmental milestone acquisition. The family unit is often profoundly impacted, with parents needing to reduce work hours or exit employment to manage appointments, therapies, and caregiving demands. At the same time, the emotional and logistical focus on the recovering child can reduce parents' time and emotional capacity to support siblings, who may experience secondary stress, anxiety, or feelings of neglect. This broader family disruption is a core reason the PICS-p framework includes a fourth domain—social health—recognizing that pediatric survivorship is inseparable from the wellbeing and stability of the entire family system.[2] Collectively, these complications underscore that effective PICS care must address not only symptoms and functional tests, but also employment, caregiving capacity, family dynamics, and social supports as integral determinants of long-term outcomes.

Patient Education

Deterrence of PICS is grounded in the recognition that prevention initiated during the ICU stay is more impactful than attempting to reverse entrenched impairments after discharge. Implementation of the ABCDEF bundle is a central preventive strategy because it targets modifiable drivers of physical disability, delirium, and psychological trauma. However, prevention should not be conceptualized as an ICU-only responsibility; it also requires continuity-focused practices across the inpatient trajectory and into the outpatient setting. One major barrier to effective deterrence is the discontinuity that often occurs during transitions from ICU to ward, rehabilitation or skilled nursing facilities, and then home. Improving these transitions requires a shift in handoff culture: alongside traditional organ-system–based summaries, handoffs should include explicit documentation of functional status, mobility level, cognitive concerns, sleep disturbance, and psychological risk factors, thereby making survivorship impairments visible and actionable for downstream care teams.[1] A practical deterrence approach is to normalize functional monitoring as a core outcome of critical care, rather than treating function as a secondary consideration. Handoffs can incorporate a brief "functional baseline

and current status" narrative, including premorbid independence, current ADL needs, mobility assistance requirements, swallowing status, delirium history, and caregiver capacity. Such a functional focus can prompt earlier PT/OT referrals, structured mobilization on the wards, and proactive discharge planning that includes home safety assessments, durable medical equipment needs, and medication simplification strategies. Because persistent deficits are frequently first recognized in outpatient care, deterrence also requires equipping primary care providers with awareness of PICS so they can identify hallmark symptoms and refer appropriately for rehabilitation, neurocognitive assessment, and mental health support.[1] This is particularly important in systems where specialized post-ICU clinics are not routinely available, making primary care the de facto surveillance setting.

Patient and family education is an essential component of deterrence because most laypersons are unfamiliar with PICS and may interpret symptoms as personal weakness, "normal aging," or inexplicable changes that generate fear and helplessness. Debriefing at ICU discharge or hospital discharge helps set expectations, reduces stigma, and encourages timely help-seeking.[1] Effective education should explain that prolonged weakness, fatigue, sleep disturbance, cognitive "fog," anxiety, depression, and intrusive memories can occur after critical illness and are often treatable or manageable with structured support. Education should also provide clear guidance on when to seek urgent care, such as for new focal neurologic deficits, chest pain, severe dyspnea, or suicidal ideation. Because caregivers often manage medications and appointments during early recovery, caregiver-directed education should be delivered alongside patient education, with attention to health literacy and language needs. Given the high frequency of mental health sequelae in ICU survivors and family members, routine referral to accessible psychotherapy services can be a reasonable preventive measure, particularly for those with delirium history, traumatic ICU experiences, or preexisting psychiatric vulnerability.[1] Low-cost interventions—such as guided coping strategies, sleep hygiene counseling, and caregiver support groups—may provide meaningful benefit even when specialty psychiatric resources are limited. Ultimately, deterrence and education are most effective when framed as a continuum: ICU prevention bundles reduce the initial insult, function-focused handoffs maintain vigilance across settings, and discharge education empowers patients and families to recognize symptoms early and engage with supportive services before impairments become chronic.

Pearls and Other Issues

The COVID-19 pandemic highlighted, in an unusually concentrated way, the conditions under which PICS risk can increase at a population level. The novel coronavirus that emerged in Wuhan, China, in December 2019 rapidly progressed into a global pandemic, periodically overwhelming hospital systems and stretching ICU capacity in multiple epicenters.[41] Although only a fraction of infected individuals required critical care, the sheer number of cases meant that many patients experienced prolonged ICU stays, mechanical ventilation, and multisystem complications, creating a large cohort at elevated risk for PICS. Pandemic surges also disrupted routine ICU practices in ways that plausibly increased vulnerability. High patient volumes, staffing shortages, and infection control constraints made consistent implementation of prevention bundles more challenging, and when ICUs are overwhelmed, adherence to best-practice protocols—such as daily sedation interruption, early mobility, and structured delirium prevention—may become difficult to sustain. A key clinical pearl from the pandemic era is that disease-specific factors can further heighten PICS risk beyond system-level strain. COVID-19 ICU patients experienced high rates of delirium, influenced by encephalopathy, severe systemic inflammation, sepsis physiology, prolonged intubation, and deep sedation requirements inherent to severe respiratory failure.[41] Delirium is not merely an acute complication; it is closely linked with later cognitive impairment and psychological trauma symptoms, making it a central mediator between ICU exposure and long-term outcomes. Another important issue is the anticipated rehabilitation burden following severe COVID-19 critical illness. While the full spectrum of long-term consequences has been evolving, early signals indicated that demand for rehabilitation services—physical reconditioning, respiratory therapy, cognitive support, and psychological care—would likely be substantial in post-ICU COVID-19 survivors.[42] This underscores a broader pearl applicable beyond COVID-19: when a new disease increases ICU admissions at scale, survivorship services must expand in parallel, or health systems risk trading acute survival gains for a prolonged wave of chronic disability.

The pandemic also revealed how visitation policies can influence psychological outcomes. To reduce transmissibility within hospitals, many institutions implemented restrictive visitation policies that left critically ill patients in near-complete isolation and separated families from bedside presence for long periods. While necessary from an infection control standpoint, such isolation plausibly increased distress for both patients and families by reducing orientation cues, emotional support, and opportunities for shared meaning-making during critical illness. In these conditions, family members often experienced heightened helplessness, uncertainty, and complicated grief, all of which can

contribute to PICS-f symptoms. A practical implication is that when in-person visitation must be restricted, systems should proactively deploy alternatives—virtual visitation, structured family updates, and telemedicine mental health support—to mitigate isolation-related harms. Outpatient clinicians should also anticipate increased mental health needs in post-ICU survivors and families when hospitalization included prolonged isolation, and should be prepared to screen for anxiety, depression, and PTSD symptoms, including in caregivers. More broadly, COVID-19 emphasized that PICS is not an isolated ICU phenomenon; it is a predictable downstream demand on primary care, rehabilitation infrastructure, mental health services, and community caregiving capacity. Health systems that plan for critical care surge capacity without parallel planning for post-ICU recovery risk creating bottlenecks in rehabilitation access and widening inequities in long-term outcomes. The pandemic thus reinforced an enduring lesson: survivorship care is an essential extension of critical care, and preparedness planning should incorporate pathways for longitudinal recovery support rather than focusing exclusively on acute bed availability.

Enhancing Healthcare Team Outcomes

Optimizing outcomes in PICS prevention and recovery requires coordinated interprofessional practice because the syndrome arises from multiple modifiable ICU exposures and manifests across domains that no single discipline can address independently. Successful implementation of the ABCDEF bundle exemplifies this reality: each element requires reliable execution, frequent reassessment, and shared accountability across physicians, nurses, respiratory therapists, pharmacists, rehabilitation specialists, and psychosocial support staff. Team performance is further shaped by institutional culture, staffing ratios, leadership support, and the presence of standardized protocols that reduce variability and sustain best practices during periods of high workload. Pain assessment and management, for example, is often nurse-led but benefits from collaboration with pain management teams when pain is complex or when opioid-sparing strategies are needed. Use of regional or neuraxial anesthesia can reduce reliance on systemic opioids, thereby limiting sedation burden and supporting earlier mobilization and delirium prevention. Pharmacists can assist by optimizing analgesic regimens, minimizing drug–drug interactions, and guiding titration plans that balance comfort with cognitive clarity. The paired implementation of spontaneous awakening trials and spontaneous breathing trials requires structured coordination between nursing and respiratory therapy, with physicians setting overarching goals and safety parameters. Nurses monitor tolerance, agitation, hemodynamics, and safety risks during awakening trials, while respiratory therapists assess ventilatory mechanics and guide trial progression, making communication and shared criteria essential to avoid unnecessary trial failure or unsafe continuation. Minimizing excess sedation similarly depends on multidisciplinary buy-in, because sedation is often used to achieve short-term stability—such as ventilator synchrony—yet it carries downstream cognitive and psychological risks. Pharmacist involvement can be particularly valuable in agent selection, dose optimization, and avoidance of benzodiazepines when appropriate. Delirium assessment and management is inherently team-based: nurses perform routine delirium screening and implement nonpharmacologic interventions, physicians investigate and treat underlying causes, and the entire team supports sleep promotion, sensory optimization, and reorientation. Even environmental design can contribute, as features like windows and natural lighting support circadian cues and may reduce delirium burden when paired with behavioral interventions.

Early mobility is among the most operationally demanding components and requires institutional support to be safe and sustainable. Mobilizing critically ill patients with lines, drains, and ventilators increases workload and fall risk, and it cannot be achieved reliably without adequate staffing and clear mobility protocols. Physical and occupational therapists provide expertise in progressive mobilization and functional retraining, while nurses ensure device safety, coordinate timing with sedation plans, and monitor physiologic tolerance. Institutions that invest in mobility teams, lift equipment, and staff training can reduce injuries and improve adherence, thereby strengthening outcomes across the physical and cognitive domains of PICS. Family engagement requires equally intentional structure. ICU physicians and nurses must provide frequent, consistent updates, while translation services ensure equitable communication for families with limited proficiency in the dominant language. Social workers, clergy, and patient advocates can support coping, clarify goals of care, and address practical barriers such as transportation, lodging, and financial strain. Standardized family conference scheduling, empathic listening approaches, and avoidance of jargon improve comprehension and trust, which may reduce PICS-f risk and improve decision quality. Finally, enhancing team outcomes also requires planning beyond ICU discharge, including functional-focused handoffs, early referral pathways, and collaboration with primary care and rehabilitation services. When teams treat survivorship as a shared responsibility across settings, rather than a post-discharge afterthought, they strengthen continuity, reduce preventable disability, and improve long-term quality of life for both ICU survivors and their families.

Conclusion:

Post–Intensive Care Syndrome underscores a paradigm shift in critical care: survival is no longer the sole metric of success. Persistent impairments in physical, cognitive, and mental health domains—often compounded by family distress—demand integrated survivorship strategies. Evidence indicates that prevention during ICU care is more effective than post-discharge remediation. The ABCDEF bundle exemplifies this approach, targeting modifiable risk factors such as immobilization, deep sedation, and delirium while promoting family engagement. Despite these advances, post-ICU clinics and telehealth follow-up remain underutilized, leaving many survivors and caregivers without structured support. Prognosis varies by domain; physical recovery is often achievable with sustained rehabilitation, whereas cognitive and psychological sequelae may persist for years, limiting independence and quality of life. Pediatric cases introduce additional complexity due to developmental trajectories and family dependency, reinforcing the need for social health considerations. Ultimately, PICS is not an isolated medical issue but a long-term public health challenge with socioeconomic implications. Nursing professionals are uniquely positioned to lead prevention, education, and continuity of care, ensuring that ICU liberation translates into meaningful recovery. Future efforts should prioritize early risk stratification, functional reconciliation, and equitable access to multidisciplinary rehabilitation to mitigate the enduring burden of PICS.

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