

Integrating Critical Care and Population Health Strategies to Improve Outcomes Among High-Risk Patients: A Conceptual Framework

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Abstract

Background: Critical care has cut short-term mortality, yet survivors carry lasting physical, cognitive and psychological impairment, and a small, identifiable population segment accounts for a disproportionate share of admissions, readmissions and cost. Critical care and population health remain separate systems, divided by unit of analysis, definition of success, time horizon, evidence standards, payment, information systems and infrastructure planning. Methods: Integrative conceptual synthesis across eleven adjacent evidence domains, reading each source for unit of analysis, time horizon and point of action on the illness trajectory. Results: The Continuum of Critical Risk framework treats critical illness as both the acute expression of accumulated clinical, physiological and social risk and a generator of new population morbidity. It organizes intervention across pre-critical, peri-critical, post-critical and community re-entry phases, resting on three enablers: integrated bidirectional data infrastructure, aligned financing and accountability, and workforce competency. Accountability moves from the bed to the at-risk population and outcome from discharge status to functional trajectory; diagnostic, pharmaceutical and infrastructural capacity are modeled as internal variables, which allows adaptation to resource-constrained systems. The framework yields six falsifiable propositions, a transition-centered measurement model and an evaluation agenda. Conclusions: Several null trials of post-intensive care services are better read as evaluation at the wrong level of analysis. Importing population risk prediction into acute triage creates an equity hazard, rationing by proxy, that requires explicit safeguards.

Keywords: critical care; population health; high-risk patients; post-intensive care syndrome; care transitions; risk stratification; value-based payment; health information exchange; health equity; health system strengthening

1. Introduction

1.1 Diminishing returns inside the intensive care unit

Critical care has exhausted its easiest gains. The practices that produced the largest mortality

reductions of the modern intensive care era, including lung-protective ventilation, early appropriate antimicrobial therapy, conservative transfusion, minimization of sedation and structured sepsis care, are now routine in well-resourced units, and the liberation bundle has consolidated much of what is known about limiting iatrogenic harm during the stay [1]. Subsequent large trials have tended to return neutral results or small effects confined to narrow subgroups. The marginal return on optimizing what happens inside the unit is falling, and the outcome most trials were powered on, mortality at a fixed early time point, is progressively less informative for a condition whose consequences unfold over years. Days alive and at home measured at 90 days after admission predicts long-term survival and functional status among mechanically ventilated patients [2], and the same metric has been validated from routinely collected data in other high-risk surgical populations [3]. Both findings point the same way: the outcome that matters to patients sits after discharge, where the intensive care unit (ICU) has neither information nor mandate. The denominator has also changed. Populations entering critical illness are older, carry more chronic disease and arrive with more functional impairment than those enrolled in the foundational trials. The epidemiological transition in many middle-income settings is visible in the cardiovascular literature, where composite metabolic indices such as the triglyceride-glucose index are associated with estimated ten-year cardiovascular risk among non-diabetic hypertensive adults in Nigeria [4] and have been proposed as a basis for stratification across sub-Saharan Africa when combined with echocardiographic parameters [5]. A patient who survives an admission today is more likely to be discharged into a long tail of dependency, rehospitalization and cumulative decline. Cognitive and functional disability after severe sepsis [6], persistent limitation five years after acute respiratory distress syndrome [7], and the prolonged dependence on organ support that defines chronic critical illness [8] have each made the same point from a different cohort: survival is the beginning of a trajectory, not its endpoint.

1.2 Two systems organized around one population

A second literature has developed in parallel. Population health has established that outcomes are produced mostly outside clinical encounters, that risk concentrates in identifiable segments, and that the levers with the largest effects are structural: housing, food security, income, transport, access to primary care and continuity of relationship with a care team [9,10]. These insights have been operationalized through provider payment reform and insurance design [11], large transformation programs spanning payers, providers and integrated systems [12], and community health worker models that extend formal services into households [13]. Population health also supplied one of the most durable arguments in epidemiology: that a large number of people at modest risk may generate more cases than a small number at high risk, so that strategies aimed only at the visibly sick cannot reduce population incidence on their own [14]. The two fields rarely speak to each other. Critical care asks what to do for the patient in the bed; population health asks what to do for the many thousands who might one day occupy it. Neither addresses the question that lies between them: how the acute and population systems should be designed together so that patients at highest risk do better across the whole course of their illness. A conceptual model of why scientific innovation fails to improve outcomes without delivery systems designed to carry it [15] describes the general pattern, and critical care is a clear instance. The acute sector has generated sophisticated knowledge about organ support; the population sector has generated sophisticated knowledge about the distribution of risk; and the patient who moves from one to the other crosses a boundary that neither system owns. The

central claim of this paper is that the boundary is not incidental. It is produced by five structural mismatches, in time horizon, evidence standard, payment, information system and infrastructure planning, that can be named, measured and redesigned.

1.3 The gap in existing frameworks

Existing frameworks address parts of the problem without joining the systems. The Chronic Care Model organizes ambulatory care for long-term conditions around an informed, activated patient and a prepared practice team, but treats hospitalization as an exogenous event rather than a phase of the same process [16]. The liberation bundle improves the stay itself but ends at the unit door [1]. Care-coordination frameworks for chronic disease locate the cause of readmission in the handover rather than in the clinical care on either side of it [17], and continuity frameworks for cardiometabolic conditions show why relational continuity matters for adherence and escalation [18], but neither extends backward into the acute decision or forward into the determinants of recovery. The post-intensive care literature has produced consensus on identifying and predicting long-term impairment [19] and a growing body of complex recovery interventions whose development and implementability remain uneven [20], yet it rarely engages with the upstream population system that produced the admission. What is missing is a structure that treats the ICU and the population system as two ends of a single trajectory, specifies what must pass between them and when, and states the conditions (financial, informational, human and physical) under which that passage is possible. Such a structure must also acknowledge that the most important resources for many high-risk patients, including laboratory turnaround, reliable access to medicines and serviceable facilities, are planned by neither clinical nor population governance. A framework that omits them is undeliverable in precisely the settings where need is greatest, and one that includes them must say how.

1.4 Aim and contributions

This paper aims to specify a conceptual framework, the Continuum of Critical Risk, that integrates critical care and population health strategies for high-risk patients, and to make it testable. It is a conceptual paper built by integrative synthesis; it does not estimate pooled effects, and the evidence it draws on is used to establish structure, mechanism and plausibility rather than to demonstrate that integration works [15,21]. Its contributions are six:

- (1) a diagnosis of the divide between the two systems as five operational mismatches (time horizon, evidence standard, payment, information system and infrastructure planning) resting on two foundational differences (unit of analysis and definition of success) [11,22];
- (2) a three-axis definition of the high-risk patient (clinical burden, physiological reserve and social exposure) that is dynamic rather than fixed [5,9];
- (3) a four-phase, three-enabler architecture that locates leverage in the transitions between phases and treats diagnostic, pharmaceutical and infrastructural capacity as variables inside the model [23,24];
- (4) six falsifiable propositions, including an explanation of why several post-intensive care trials returned null results [25-27];
- (5) a transition-centered measurement model with equity stratification built in [2,28]; and
- (6) an analysis of the equity hazards that follow when population risk prediction enters acute care, with rationing by proxy identified as the most serious [29].

2. Conceptual and Methodological Approach

2.1 Integrative conceptual synthesis

The framework was constructed through integrative conceptual synthesis. In this approach, literatures that do not normally cite one another are read together, their shared structure is identified, and the points at which they constrain or contradict one another are made explicit. The method suits theory building rather than effect estimation: sources are combined analytically, not statistically, and the product is a set of constructs, relationships and propositions rather than a summary estimate. The approach is appropriate here because the question concerns the design of a relationship between two systems, for which no body of comparative trials exists and for which randomization of the relevant exposures (housing, payment model, information architecture) is rarely feasible [21]. The method is also consistent with how conceptual models of delivery failure have been developed in health systems research, where the unit of explanation is the configuration of institutions rather than the efficacy of an intervention [15]. The synthesis is positioned accordingly: it states what the evidence supports, marks where the framework goes beyond the evidence, and converts the most consequential inferences into propositions that later empirical work can refute.

2.2 Source domains

Eleven evidence domains contributed, each supplying a distinct component of the framework (Table 1). Critical care outcomes and post-intensive care recovery provide the temporal structure of the trajectory and the definition of outcome [30,31]. Cardiovascular and chronic disease epidemiology describes the composition of clinical risk [4,5]. Health system strategy and financing supply the accountability architecture [11,12]. Healthcare infrastructure and diagnostic facility design define the physical preconditions for any care model [23,32]. Nursing practice describes the mechanics of transitions [17,33]. Public health informatics and surveillance supply population-level identification [34,35]. Pharmaceutical access and supply chain governance describe the constraint of medicine availability [24,36]. Digital health and equity literature describe the distributional consequences of technology-mediated care [37,38]. Artificial intelligence (AI) governance literature describes safeguards around automated stratification [39,40]. Data governance and security literature sets consent and protection conditions [41,42]. Health professional education supplies workforce competencies [43,44]. A deliberately wide corpus was retained because several of the most consequential constraints on integration, including capital planning, supply reliability and data protection, are studied mainly outside clinical journals; cross-sector sources are used as analogues and governance precedents, never as evidence of clinical effect.

Table 1. Evidence domains contributing to the framework, the component each supplies, and illustrative sources.

Domain	Component supplied to the framework	Illustrative sources
Critical care outcomes and post-intensive care recovery	Temporal structure of the trajectory; outcome defined as functional trajectory	[2,6,7,30]
Cardiovascular and chronic disease epidemiology	Composition of clinical risk; interaction of conditions	[4,5,45]
Health system strategy and financing	Accountability and payment architecture	[11,12,46]

Domain	Component supplied to the framework	Illustrative sources
Healthcare infrastructure and diagnostic facility design	Physical preconditions and capacity as a model variable	[32,47,48]
Nursing practice	Mechanics of handover and in-hospital harm prevention	[17,33,49]
Public health informatics and surveillance	Population-level identification and signal-to-response interval	[34,35,50]
Pharmaceutical access and supply chain governance	Medicine availability and quality as a recovery constraint	[24,51,52]
Digital health and equity	Distributional effects of technology-mediated care	[37,38,53]
AI governance	Safeguards around automated stratification	[39,40,54]
Data governance and security	Consent, sensitivity classification, protection	[42,55,56]
Health professional education	Boundary-spanning competencies and workforce equity	[43,44,57]

2.3 Analytic procedure

Each source was read for three attributes: the unit of analysis it assumed (patient, episode, facility, population or system), the time horizon on which it worked (hours, days, months or years), and the point on the illness trajectory at which it acted (before, during or after critical illness, or at re-entry into the community). Plotting sources on these attributes made the gap visible. Work concentrated at particular points, such as in-unit physiology, discharge planning and population surveillance, and thinned to almost nothing at the joints between them. The four-phase structure was derived from where that thinning occurred rather than imposed in advance, and the transitions between phases were defined as the joints themselves. Each joint was then treated as an interval between information becoming available and action being taken, the construct that real-time hospital informatics treats as a modifiable performance variable [58]. Where domains disagreed, for example on whether observational evidence should inform acute decisions, the disagreement was retained and named as a tension rather than averaged away. Where a domain supplied capability without evidence of health effect, as with predictive analytics for health system performance [21], the capability was admitted to the framework only with an explicit statement of the condition under which it could improve outcomes.

2.4 Criteria for judging the framework

A conceptual framework is judged not by whether it is true but by coherence, parsimony, generativity and usefulness. Coherence requires that constructs are defined consistently and that the relationships among them do not contradict the evidence on which they rest. Parsimony requires that each component earns its place; the framework was reduced repeatedly until removing any phase or enabler left an observed failure unexplained. Generativity requires that the framework produces hypotheses that could be wrong, which is why Section 6 states six

falsifiable propositions and pairs each with a study design. Usefulness requires that the framework changes what a manager, clinician or funder would do in practice, which is why Section 7 specifies implications at the level of fields in a record, documents, roles and contracts. The Chronic Care Model is an instructive comparator: its influence came less from novel evidence than from giving practices a structure that turned diffuse findings into specific design choices [16]. The prevention paradox shows the opposite risk, that a well-evidenced idea can be ignored when it lacks an organizational home [14]. Section 7.8 states where the present framework falls short on these criteria.

3. Evidence Synthesis: The Structural Divide

3.1 From coordination problem to structural divergence

The separation between critical care and population health is usually described as a coordination problem, to be solved with better communication, liaison roles or shared meetings. The synthesis supports a different reading: the separation is a divergence along seven dimensions, two foundational and five operational, each of which independently obstructs integration (Table 2). The foundational differences concern what each system counts as its object and what it counts as success. Critical care takes the individual episode as its unit and survival to discharge as its principal marker; population health takes a defined population or segment as its unit and incidence, functional status and the size of equity gaps as its markers. The five operational mismatches follow from these. They explain why integration efforts that address only one of them, most commonly information exchange, tend to produce local improvement without durable change. Multi-tier accountability models from long-term care make the same structural point in a different setting: indicators defined at the level of the unit cannot capture performance that depends on relationships between tiers [59]. A framework for integration therefore has to act on all seven dimensions, not only the one most visible to clinicians.

Table 2. Dimensions of divergence between critical care and population health, and the integration requirement each implies.

Dimension	Critical care	Population health	Integration requirement
Unit of analysis (foundational)	Individual patient episode	Defined population or segment	Attribute each ICU episode to a population with a named accountable entity
Definition of success (foundational)	Survival to discharge; short-term mortality	Incidence, functional status, equity gap	Functional trajectory and days alive and at home as shared outcomes [2]
Time horizon	Hours to days	Years to decades	Transition indicators that bridge the clocks [58]
Evidence standard	Randomized trial	Observational and quasi-experimental	Real-world evidence methods acceptable to both fields [21]

Dimension	Critical care	Population health	Integration requirement
Payment	Bed-day, procedure or episode	Capitation, shared savings, attributed lives	Mechanisms that let the preventing entity capture avoided acute cost [11]
Information system	Dense, high-frequency, physiological	Sparse, administrative, social	Bidirectional longitudinal record [22]
Infrastructure planning	Facility and equipment procurement	Rarely engaged	Diagnostic and supply capacity planned against population need [23]

3.2 Temporal mismatch

Critical care compresses decision-making into short intervals; population health accumulates small effects over long ones. A clinician optimizing the next six hours and a manager optimizing the next six years are not disagreeing; they are operating on incommensurate clocks. The consequence is that information generated on one clock is rarely usable on the other. Track-and-trigger systems such as the National Early Warning Score were built to discriminate, within hours, which ward patients are at risk of cardiac arrest, unanticipated ICU admission or death [60]. They are a triumph of short-horizon design, and they are deliberately blind to the months of community signal that preceded the admission. The interval between information becoming available and action being taken is a modifiable performance variable within hospitals, and real-time informatics and performance analytics can compress it [58]. The delay between a community signal (a missed dialysis session, a lapsed prescription, a change of shelter) and an acute response is the same phenomenon at a longer scale, yet it is almost never measured. Outcome measures reproduce the mismatch at the far end of the trajectory: a 28-day mortality endpoint closes the account before most of the consequences of critical illness have appeared, whereas days alive and at home at 90 days captures part of the recovery period [2]. The framework's response is to define transitions as the points at which the two clocks must be synchronized and to measure them directly.

3.3 Epistemic mismatch

Critical care built its authority on the multicenter randomized trial and treats non-randomized evidence as provisional. Population health works observationally and quasi-experimentally, because randomizing housing, income or neighborhood is usually impossible. Each field therefore discounts the other's strongest findings. The intensivist is unpersuaded by cohort evidence that social isolation predicts poor recovery; the population health analyst is unpersuaded by a null trial of a post-ICU clinic whose participants returned to unchanged circumstances. Trials of follow-up services after ICU discharge illustrate the problem. A pragmatic multicenter trial of nurse-led follow-up programs [25], a trial of increased hospital-based rehabilitation and information after ICU discharge [27], and a Cochrane review of follow-up services [26] did not establish clear benefit, and meta-analyses of enhanced physical rehabilitation after ICU discharge [61] and of psychological follow-up for patients and caregivers [62] reached cautious conclusions. Read within critical care's epistemic frame, these results

suggest follow-up is of limited value. Read within population health's frame, they are evaluations of partial interventions at the wrong level of analysis. Real-world evidence methods and predictive analytics have been advanced as a bridge between these standards [21]; without such methods, the integration questions posed here are unanswerable by the standards either field accepts.

3.4 Financial mismatch

The ICU is typically a cost center reimbursed for activity, while population health interventions are funded from budgets that do not capture the acute savings they generate. An intervention that prevents admissions reduces revenue for the unit that would have delivered the care and saves money for a payer who did not fund the intervention. The mismatch is structural, not attitudinal. Critical reviews of health insurance financing and provider payment reform show how difficult it is to balance coverage expansion against financial protection when payment rewards volume, and how incentive alignment changes behavior only where the accountable entity also controls the levers [11]. Analyses of transformation programs across payers, providers and integrated systems map the available corrections and the conditions under which each fails [12]; programs are most exposed when the entity bearing the costs of change differs from the one receiving its benefits. For the high-risk patient, the consequence is that every phase of the trajectory is funded by a different account, and no account is charged for the transitions. The pharmaceutical sector shows the same pattern at a different scale: value-based pricing and market access strategies attempt to link payment to outcomes realized long after purchase, and they face the same attribution and time-lag problems [63].

3.5 Informational mismatch

The acute record is dense, high-frequency and physiological; the population record is sparse, administrative and social. A clinician cannot readily see that a patient has missed four dialysis sessions and moved shelters twice; a care manager cannot see that the same patient spent nine days on a ventilator. Closing this gap requires interoperability, data quality and analytic capability to be treated as one connected problem rather than three procurement exercises [22]. Structured information flow is itself a determinant of quality where continuity is fragile, as digital operations models in mental health care propose for patients who move among services [64]. Lifecycle performance management in infrastructure delivery offers a transferable lesson: data architectures designed around a single project phase lose value at each handover, whereas those designed around the full lifecycle retain it [65]. The same is true of clinical records designed around a single episode. The informational mismatch also has a directional asymmetry. Most integration efforts push acute data outward at discharge; very few pull community and social data inward at admission, even though that is when they would change decisions. The framework treats this asymmetry as a design target rather than a technical detail.

3.6 Infrastructural mismatch

The infrastructure both systems depend on is planned by neither. Healthcare infrastructure functions as a public health intervention in its own right, as evidence from large laboratory networks indicates [23], and translating infrastructure investment into measurable population and diagnostic outcomes requires deliberate linkage between capital planning and service planning [32]. Diagnostic access expands or contracts with the geographic distribution of built capacity [48]; laboratory spatial planning affects diagnostic accuracy, safety and throughput [66]; and

regulatory-compliant design determines whether molecular and pathology services can operate at all [67]. When capacity is commissioned without reference to population need, it tends to be distributed by construction convenience rather than by where high-risk patients live. For critical care this matters because acute decision quality is bounded by diagnostic turnaround; for population health it matters because identification without confirmatory testing produces lists, not diagnoses. Program management models for multi-site infrastructure expansion show that such capacity is built through processes with their own timescales and governance, typically longer than a clinical funding cycle [68]. The framework therefore treats built capacity as a variable to be stated, not an assumption to be left outside the model.

3.7 Consequences of the divide

The divide produces four recurring failures. The first is late recognition of deterioration that was visible for weeks in community data but not in the acute record. The second is context-blind acute decision-making about escalation, discharge destination and goals of care, taken without knowledge of the patient's baseline function, social circumstances or previously expressed preferences. The third is discontinuous recovery, in which survivors enter community systems that know little of what happened to them; qualitative work with ICU survivors describes exactly this experience, with patients identifying information, coordination and psychological support as the services most often missing after discharge [69]. The fourth is recurrent presentation, in which the same patients return having been treated expertly for a condition whose drivers were never addressed. Readmission-reduction frameworks for chronic disease trace this last failure to how responsibility is passed between settings [17]. A systems-level policy framework for integrating mental health screening into primary care in low-resource settings identifies a parallel failure, in which detection occurs without a pathway to response [70]. These failures are not the product of individual clinicians. They are the predictable output of two systems designed independently and connected only at admission and discharge.

3.8 Defining the high-risk patient

Critical care usually means by "high risk" a high risk of imminent death; population health usually means a high risk of high utilization. Neither suffices for integration, because each omits what the other measures. This paper defines a high-risk patient as one situated unfavorably on three interacting axes: clinical burden, physiological reserve and social and structural exposure. Clinical burden means multimorbidity, particularly combinations involving chronic organ failure, immunosuppression or malignancy, where the number and interaction of conditions matter more than the severity of any one. The cardio-renal continuum illustrates the point: metabolic dysfunction, hypertension and renal impairment co-vary in ways that make single-condition management misleading [5], risk estimation depends on composite rather than isolated measures [4], and current hypertension guidance spans pharmacological, dietary and behavioral components at once [45]. Physiological reserve means frailty, sarcopenia, cognitive impairment and baseline dependency, which determine not whether a patient survives the insult but whether the patient recovers from the treatment. Reserve overlaps with modifiable cardiometabolic risk: reviews of diet, exercise and stress reduction [71] and of plant-based diets [72] report cardiovascular benefits, and nutritional exposures have been examined in relation to DNA markers of cardiac risk among adults with type 2 diabetes [73]. Social and structural exposure means housing instability, food insecurity, low income, isolation, limited health literacy, discontinuous primary care and the cumulative effects of discrimination. Together these

determine whether risk is detected early, whether treatment is adhered to, and whether recovery is possible in the environment to which the patient returns. Integrative models addressing socioeconomic inequity in rural maternal health make the mechanism explicit, locating the binding constraint in the surrounding conditions rather than in the clinical intervention [74]. The axes interact rather than add. A frail patient with strong social support follows a different trajectory from an identically frail patient who is unhoused, and multicenter work in sepsis survivors has examined the frequency of post-intensive care syndrome components alongside the patient-level risk factors that accompany them [75]. Two properties of this definition give it practical force. The first is concentration: a small proportion of the population consistently accounts for a large share of acute utilization across countries and financing models. Concentration makes targeted integration feasible and makes business intelligence methods for allocating scarce capacity against measured need applicable, as their use in mental health and substance use services demonstrates [76,77]. The second is dynamism: risk rises and falls with a bereavement, a lost tenancy, a lapsed prescription or a transition between settings. AI-based stratification frameworks for emergency preparedness already update estimates as conditions change rather than classifying populations once [78], and prediction systems integrating climate data with health outcomes apply the same principle to mortality risk [79]. Transitions between settings are the periods of highest risk and of least organization, which is why the framework locates its leverage there.

3.9 The critical illness trajectory

Situating the three axes in time yields the trajectory around which the framework is built (Figure 1). Accumulated clinical and social risk produces deterioration, which is often detectable before it is physiologically obvious. Deterioration produces critical illness, which ends in death or in survival with new or worsened deficits. Survival leads either to durable risk reduction, if the context to which the patient returns has changed, or to return to an unchanged context in which risk is now higher than before the admission. That return loop is the central object of the framework. Life-course epidemiology supplies its logic: exposures accumulate and interact over time, and the timing of an exposure matters as much as its magnitude [80]. Chronic critical illness supplies its clearest empirical instance, a population that is produced by the success of acute care and then held at the boundary between systems [8]. Conventional critical care intervenes at a single node of this diagram. The framework's claim is that outcomes for high-risk patients are determined less by the quality of that node than by what happens on the arcs that enter and leave it.

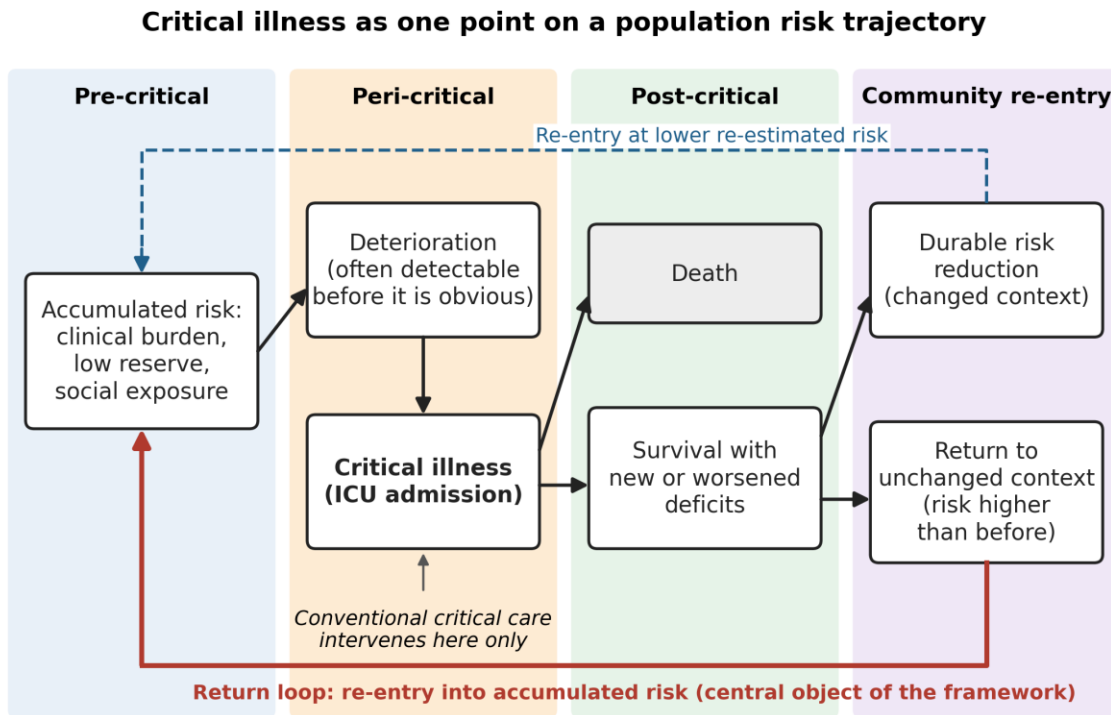


Figure 1. The critical illness trajectory. Accumulated clinical, physiological and social risk produces deterioration and then critical illness; survivors either achieve durable risk reduction in a changed context or return to an unchanged context at higher risk, closing the return loop (solid red line) that the framework targets. Shaded bands mark the four phases of the Continuum of Critical Risk.

4. Theoretical Foundations

4.1 Life-course epidemiology and the social determinants of health

Seven bodies of theory are combined in the framework. None is novel; the contribution lies in their combination and in specifying how they constrain one another. Life-course epidemiology holds that exposures accumulate and interact over time to produce disease, that there are sensitive periods in which exposures have larger effects, and that chains of risk link early disadvantage to later illness [80]. Applied to critical care, it reframes an admission as a point on a trajectory rather than an accident, and implies that the determinants of who is admitted and who recovers were substantially set before the admitting diagnosis existed. Social determinants theory adds the distributional claim: the distribution of disease follows the distribution of material and social conditions, and clinical care modifies only part of the resulting variation [9,10]. The implication often missed in critical care is that social conditions affect not only who becomes critically ill but how well identical treatment works, since adherence, participation in rehabilitation, nutrition and access to medicines are all socially patterned. Policy frameworks for chronic disease management in underserved United States communities treat social context as the primary design constraint rather than a complicating factor [81], and trauma-informed educational frameworks for adolescents in underserved communities extend the same logic to the developmental origins of adult vulnerability [82].

4.2 Chronic critical illness and post-intensive care syndrome as population morbidity

Two constructs from critical care research carry the argument that the ICU produces, as well as receives, population risk. Chronic critical illness describes patients who survive the acute phase but remain dependent on organ support; its epidemiology in the United States shows a population that consumes a large share of resources and has poor long-term outcomes [8]. Post-intensive care syndrome (PICS) describes new or worsened physical, cognitive or mental health impairment arising after critical illness and persisting beyond discharge [31], with a family counterpart in which relatives experience psychological morbidity of their own [83]. Stakeholder conferences extended the concept from recognition to improvement of long-term outcomes [30], a concept analysis clarified its attributes and consequences [84], and recent reviews have summarized its evolving epidemiology and management [85]. Caregiver burden has been linked to the patient's PICS components [86], and a consensus conference has addressed prediction and identification of long-term impairment [19]. The clinical mechanisms of survivorship care lie outside the scope of this paper, which uses PICS at system level. The structural point is that critical care generates population-level morbidity. The unit is therefore not only where population risk becomes visible but also where new population risk is produced, and a framework that ignores this treats the ICU as a consumer of upstream failure when it is also a source of downstream burden.

4.3 Structure, process and outcome across a continuum

Donabedian's triad of structure, process and outcome remains the standard scaffold for evaluating quality of care [87]. Applying it across a continuum changes what each term denotes. Structure becomes the configuration of acute and community systems together, including the data links, payment arrangements and roles that join them. Process becomes the handovers between systems rather than actions within either. Outcome becomes the population's functional trajectory rather than the episode's endpoint. Most quality measurement fails at the first step because it measures within one silo; indicators that are individually valid can then coexist with a pathway that fails at every joint. Multi-tier accountability models in long-term care show the alternative, defining key performance indicators at system rather than unit level with explicit attribution at each tier [59]. Analyses of Healthcare Effectiveness Data and Information Set measures for geriatric care add a warning: unstratified measures conceal precisely the variation that matters for equity, and governance frameworks are needed to make stratified reporting routine [28]. The measurement model in Section 6 takes both lessons: every indicator is attached to a transition or a population, and every indicator is stratified.

4.4 Population segmentation and the prevention paradox

Population segmentation divides a population into groups with common needs so that care models can be matched to them. It supplies both the machinery for identifying who should receive integrated intervention and a defensible basis for allocating scarce capacity. AI-based decision support systems for healthcare operations and resource planning provide the analytic layer [88], and performance intelligence models extend it to optimization and outcome measurement across large public services [89]. Segmentation also supplies the framework's principal danger. Prediction learns from historical patterns of care that were themselves inequitable; a widely used commercial algorithm that predicted health care costs as a proxy for health need systematically underestimated the needs of Black patients, because less had historically been spent on them at the same level of illness [29]. The prevention paradox sets a

further limit on what segmentation can achieve [14]. Most critical illness arises in people not individually identified as high risk, simply because the low-risk majority is large. Targeted integration is justified for the concentrated segment in which per-person benefit is largest, but it cannot reduce population incidence alone. The framework therefore couples targeted intervention with population-wide measures and treats the two as one system rather than as substitutes.

4.5 Infrastructure as a feasibility constraint

The seventh body of theory is less commonly invoked in clinical frameworks: the design, siting and lifecycle management of physical capacity set an upper bound on what any care model can achieve. Sustainable laboratory infrastructure models for resource-constrained health systems [47] and lifecycle performance evaluations of purpose-built diagnostic laboratories [90] show that diagnostic capacity is a long-lived asset whose performance depends on decisions made years before any patient is tested. That capacity is built through program management processes with their own governance and timescales [68], and capital project delivery models for high-risk healthcare infrastructure show how such processes fail, through scope drift, underestimated risk and weak accountability [91]. The theoretical move is modest but consequential: infrastructure is a constraint to be stated rather than assumed. Once stated, the constraint can be sequenced, since the binding limit differs by phase and by setting. This is what allows the framework to remain the same across very different health systems while prescribing different investment sequences.

4.6 Premises of the framework

Four premises follow from combining these bodies of theory. First, critical illness is the acute expression of accumulated, partly modifiable and unevenly distributed population risk, as life-course and social determinants theory imply [9,80]. Second, critical care both responds to and generates population morbidity, as the chronic critical illness and PICS literatures show [8,31]. Third, targeted intervention is feasible because risk is concentrated and dynamic, and transitions between settings are the points of highest leverage, as segmentation and continuity research suggest [18,88]. Fourth, the feasible set of interventions is bounded by capacity that must be modeled inside the framework rather than assumed outside it [47]. Each premise constrains the others. The first without the second produces an upstream prevention model that ignores the damage done by the unit. The second without the third produces a survivorship program without a basis for targeting. The third without the fourth produces an identification system that flags patients no one can serve. The Continuum of Critical Risk is the structure that holds all four at once, and the propositions in Section 6 are derived from their joint implications rather than from any one alone [15].

5. The Continuum of Critical Risk Framework

5.1 Core proposition and architecture

The core proposition of the framework is that outcomes for high-risk patients are determined less by the quality of care at any single point in the trajectory than by the continuity of risk management across it. Excellence at one node cannot compensate for discontinuity between nodes. The framework has two dimensions (Figure 2). The horizontal dimension is temporal and comprises four phases: pre-critical, peri-critical, post-critical and community re-entry. The phases run in sequence and loop, since a patient who completes community re-entry returns to the pre-critical phase with risk re-estimated. Four transitions (T1 to T4) join the phases and are

the framework's principal points of leverage and measurement. The vertical dimension is structural and comprises three enablers that must be present in every phase: integrated data infrastructure (Enabler A), aligned financing and accountability (Enabler B), and workforce and cultural competency (Enabler C). Absence of an enabler disables every phase above it, which is why the enablers are foundational rather than a fifth phase. A band of capacity variables (diagnostic, pharmaceutical and infrastructural) sits between the phases and the enablers, marking constraints that are modeled rather than assumed. The architecture borrows the Chronic Care Model's insistence that care is produced by a system rather than a visit [16] and the liberation bundle's insistence that iatrogenic harm is preventable by design [1], and extends both across the acute boundary.

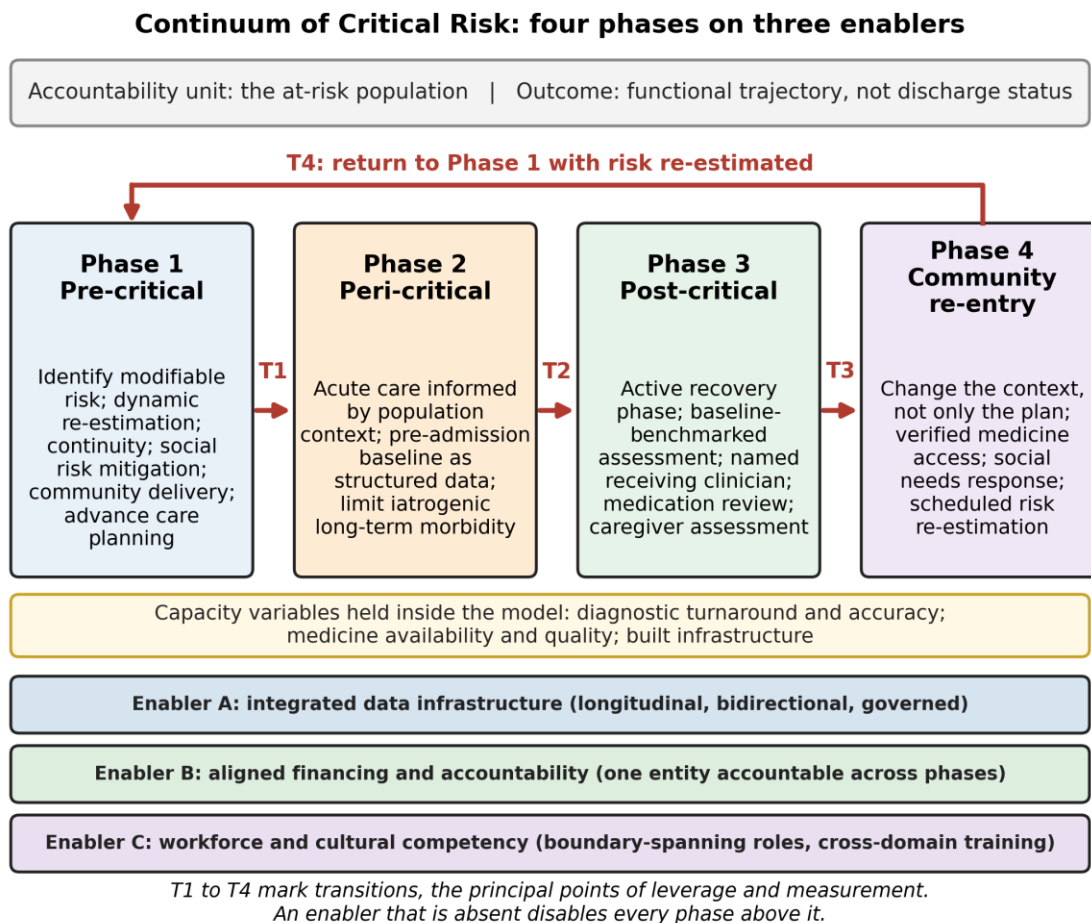


Figure 2. Architecture of the Continuum of Critical Risk framework. Four temporal phases are joined by transitions T1 to T4 (red arrows), with T4 returning the patient to the pre-critical phase with risk re-estimated. Capacity variables and three cross-cutting enablers underpin every phase; accountability is set at the level of the at-risk population and outcome at the level of functional trajectory. The four phases are specified in Table 3, which lists for each the objective, the principal transition it hands to the next phase, and the constraint most likely to bind in resource-constrained settings. The sections that follow describe each phase and enabler in turn.

Table 3. Phases of the Continuum of Critical Risk: objective, outgoing transition and binding constraint in resource-constrained settings.

Phase	Objective	Outgoing transition and what must pass	Binding constraint where capacity is limited
1. Pre-critical	Identify accumulating risk while modifiable; reduce probability and severity of critical illness	T1: population context (baseline function, social status, preferences, actual medication use) arrives with the patient [22]	No routine contact with at-risk populations; answered by community health workers and mobile channels [13,92]
2. Peri-critical	Deliver acute care informed by population context; avoid avoidable long-term morbidity	T2: discharge summary recording what was lost, not only what was done	Diagnostic turnaround and accuracy; answered by laboratory quality systems [93]
3. Post-critical	Treat the interval after ICU discharge as an active phase with accountability for functional recovery	T3: a named receiving clinician holding the recovery plan	Absence of rehabilitation; answered by task-shifted nurse-led follow-up [94]
4. Community re-entry	Return the patient to a context in which recovery is possible; reduce composite risk	T4: re-entry to Phase 1 with risk re-estimated	Medicine availability; answered by supply chain resilience [24,51]

5.2 Phase 1: Pre-critical

The objective of the pre-critical phase is to identify accumulating risk while it is still modifiable and to reduce the probability and severity of the critical illness that would otherwise follow. Identification should combine three sources rarely combined: clinical data, utilization data (including missed appointments and prescriptions not collected), and social data (including housing, food security and caregiver status). The surveillance literature supplies both machinery and caution. Frameworks for national real-time disease surveillance dashboards [34] and national public health dashboards for transparent decision-making [95] show that population signals can be assembled and made actionable at scale; big-data predictive models apply the capability prospectively at population and regional levels [96]; and advanced computational epidemiological models have been proposed to shorten the signal-to-response interval further [97]. Implementation evaluations counsel caution: an evaluation of integrated disease surveillance in one Nigerian state found that dashboard capability was limited by data quality and surveillance capacity [35], and an analysis of the national surveillance system reached a similar conclusion about the data foundations of epidemic preparedness [50]. Public health informatics frameworks built to protect vulnerable populations indicate what the governance layer of such systems must contain [98]. Two design choices matter more than the algorithm. Identification must be dynamic and re-estimated on event triggers, since a quarterly refresh

misses the patient whose risk changed last week. Identification must also trigger an action with capacity attached. A flag delivered to a team with no available response converts an analytic achievement into alert fatigue and patient labeling, so identification capacity should track intervention capacity rather than population size. Public health governance models built on process optimization and performance metrics make the same observation about regulatory oversight: measurement without a response pathway generates oversight activity rather than improvement [99]. Five classes of intervention follow. Continuity of relationship improves detection, adherence and appropriate escalation, and is among the few interventions plausibly affecting all three risk axes at once; policy frameworks for cardiometabolic conditions tie it to interruption of the deterioration pathway rather than to satisfaction [18]. Chronic disease optimization at interaction points targets the combinations that most often precipitate critical illness rather than optimizing conditions in isolation [4,5]. Social risk mitigation addresses housing, food, income, transport and medication cost, which for some patients are the rate-limiting factor in whether clinical care works at all, and policy work on integrating mental health screening into primary care in low-resource settings shows how screening and response can be embedded in routine contact [70]. Community-based delivery extends reach into populations that facilities do not touch, with supervision, task definition and linkage to the formal system as the design pattern [13], supported by frameworks for scaling mobile health for chronic disease monitoring and adherence [92], reviews of telehealth effectiveness in bridging rural-urban disparities [37], and conceptual work on the determinants of telehealth adoption among rural and underserved populations [38]. Advance care planning belongs early and in the community, since planning first attempted during an admission occurs under conditions that systematically distort it. AI-driven early detection systems for non-communicable disease have moved from development to implementation [100]. The framework constrains such tools in two ways. Detection must be matched to response capacity, and the governance conditions are not incidental: comparative analyses of AI-driven healthcare management in the United States and developing countries show that executive oversight, regulatory structure and accountability vary widely around identical technical capability [39], as does organizational readiness for generative AI integration, examined in two comparative analyses of management capability in the United States and low- and middle-income countries [101,102]. Population-wide measures complete the phase. One Health research shows how far upstream some determinants sit: environmental microplastics have been examined as vectors for avian virus transmission with implications for food safety [103], and AI-enabled biosensors have been proposed for rapid detection of antimicrobial resistance in foodborne pathogens [104]. Such determinants act on population risk long before any clinical encounter, which is why the prevention paradox requires targeted and population-wide strategies to be designed together [14]. The transition out of this phase (T1) is the arrival of population context into the acute encounter, and in current practice it is almost entirely lossy: the patient arrives, and what the community system knew does not.

5.3 Phase 2: Peri-critical

The objective of the peri-critical phase is to deliver acute care informed by the patient's population context while avoiding avoidable long-term morbidity. This is where the framework most often meets resistance, because it appears to ask acute clinicians to take on work that is not theirs. The position is narrower. Population context should be available at the decisions where it changes the right answer, and the acute system should own the long-term morbidity it produces. Five acute decisions are improved by population context. Baseline function and trajectory

distinguish a reversible insult from the final phase of a long decline, informing decisions about escalation. Documented prior preferences and surrogate capacity inform goals of care. Housing stability, caregiver availability and affordability of the regimen inform discharge destination. Knowledge of which medicines were actually being taken, rather than those listed, informs reconciliation. The pre-admission functional baseline informs rehabilitation planning, without which "return to baseline" is undefined. In current practice, several of these are made without the relevant information. In-hospital deterioration scores discriminate short-term risk from physiology [60], but no physiological score encodes whether the patient lived alone or had stopped a medicine two months earlier. Pre-admission functional and social status should therefore be captured as a structured element of the acute record with the same standing as a severity score, since severity scores predict mortality but not recovery, and the principal determinants of recovery are currently recorded, if at all, in free text. Acute decision quality is also bounded by diagnostic turnaround and accuracy, a dependency that integration models routinely omit. Frameworks for strengthening pre-analytical and analytical quality systems in resource-limited laboratories [93], integrated laboratory information systems designed to improve infection detection accuracy [105], and reviews of diagnostic integration across microbiology, virology and serology workflows [106] describe the determinants of what can be known and when. Laboratory spatial planning affects accuracy and throughput [66]; molecular methods such as droplet digital polymerase chain reaction extend what can be quantified [107]; and automated image analysis, as in template-matching detection of architectural distortion in mammograms, illustrates how computational methods alter diagnostic yield [108]. Diagnostic capacity belongs inside the acute care model, not beside it. Population context enters acute decisions through people rather than fields in a record. Multidisciplinary collaboration affects patient outcomes in emergency departments [109]; interdepartmental coordination supported by digital tracking improves patient flow [110]; and emergency response coordination across hospital units [111] and behavioral health crisis response across multi-hospital networks [112] depend on explicit frameworks rather than local convention. Readiness models from high-consequence energy and process facilities show that response capability is designed rather than emergent [113]. Staffing is a precondition of care model design rather than its consequence, as governance frameworks for workforce planning and nurse-patient ratios make clear [114].

Practices that increase long-term impairment, including prolonged deep sedation, immobility, avoidable delirium and unnecessary device days, are not only quality defects but mechanisms by which acute care adds to the population's burden of disability. Liberation practice already addresses these [1]; the framework adds a population rationale to the unit-level one. Several classes of in-hospital harm belong under the same heading, each reducing the deficit burden with which a survivor leaves: falls, addressed through policy-integrated nursing workflows [49]; infection prevention and control compliance [115]; patient safety in high-acuity nursing units [33]; antimicrobial stewardship [116]; structured neurovascular monitoring after orthopedic surgery [117]; evidence-based wound care [118]; and postoperative pain management through integrated nursing communication [119]. The occupational safety literature supplies mechanisms the acute sector under-uses: proactive hazard recognition and near-miss reporting [120], continuous hazard monitoring [121], and models of why unsafe behaviors recur, which explain why gains in harm reduction decay without reinforcement [122]. For a subset of patients, the trajectory-informed answer is that escalation will not restore an outcome the patient would accept. Framing palliative involvement as concurrent trajectory management, rather than as the alternative to critical care, dissolves part of the divide. The outgoing transition (T2) is carried by

the discharge summary, the framework's most consequential and most neglected artifact. It typically records what was done and rarely what was lost. It should transmit the pre-admission baseline, the duration of delirium, exposure to ventilation and immobility, new deficits, medicines started in the unit with review dates, and the recovery risks that the receiving team should watch for.

5.4 Phase 3: Post-critical

The objective of the post-critical phase is to treat the period between ICU discharge and community re-entry as an active phase rather than an administrative interval, with explicit accountability for functional recovery. After discharge, responsibility for the consequences of critical illness belongs to no one in particular. The intensivist's responsibility ends at the unit door, the ward team manages the presenting condition, and the primary care clinician receives a summary describing an admission they did not witness, for sequelae they were not trained to recognize, in a patient whose baseline they may no longer know. The vacuum is structural: no party holds the information, the mandate and the capacity at the same time. Survivors nevertheless constitute a definable population with patterned needs, including weakness, cognitive impairment, anxiety, depression, post-traumatic symptoms and frequent rehospitalization [6,7,30,31], with caregivers carrying a parallel burden [86]. Treating this as a population health problem rather than a set of individual complications has three consequences: it justifies a defined pathway rather than ad hoc referral, makes the population countable and therefore fundable, and permits outcome measurement where the variation appears. Days alive and at home after critical illness is one such measure, and its association with skilled rehabilitation received in hospital among older adults [123] and with long-term survival and function among ventilated patients [2] shows that it is sensitive to the kinds of processes this phase contains. At system level, six components define the phase; their clinical content is well described elsewhere, and the framework's concern is who holds each and how it connects to the adjacent phases. The first is structured functional assessment before ward discharge, benchmarked against the Phase 2 baseline, without which it is uninterpretable. The second is medication review with explicit deprescribing at a named, dated and assigned review point, with interaction screening structured rather than left to individual vigilance, as a framework for systematic interaction screening developed for antenatal care proposes [124]. The third is a named receiving clinician, identified before discharge and communicated in writing. The fourth is early follow-up timed to the first weeks rather than months. The fifth is caregiver assessment, since caregiver capacity shapes patient outcome; a systematic analysis of nurse-led dementia care among community-dwelling older adults, a population in which caregivers carry much of the daily care, reports effects on health outcomes [94]. The sixth is coordinated rehabilitation planning across sites; where recovery spans several facilities, project-management discipline becomes a clinical variable, as work on multisite implementation of motor-rehabilitation programs for children with autism spectrum disorder illustrates by analogy [125]. The accountability test of the outgoing transition (T3) is simple and rarely met. The receiving team should be able to state what the patient's function was before admission, what it is now, and what must change in the next ninety days. Systematic review of complex interventions after ICU hospitalization found that their development and implementability were inconsistently reported [20], which is consistent with the framework's reading that the problem is less the content of recovery services than the absence of an accountable holder. Continuity frameworks for equitable access to chronic therapies in hospital pharmacy settings add that recovery pathways

often fail at the point of supply rather than recognition [126], a failure that Phase 4 is designed to address.

5.5 Phase 4: Community re-entry and durable risk reduction

The objective of the community re-entry phase is to ensure that the patient returns to a context in which recovery is possible and that the risk which produced the critical illness is measurably lower. This phase closes the loop in Figure 1 and is the one most often omitted. A patient discharged with an excellent plan into the same unstable housing and absence of continuity in primary care has received a plan, not a change in risk. The framework treats the environment as a clinical variable, not a metaphor. Whether a survivor can exercise, afford and store medication, reach rehabilitation or eat adequately for anabolic recovery depends on conditions that are measurable and modifiable, often by agencies outside the health system. Four components define the phase, in addition to the medicine access requirements set out in Section 5.6. The first is a response to social needs rather than screening alone, since an unfunded referral pathway produces documentation rather than change. The second is rehabilitation delivered where the patient is, for those whose access constraints bind, following the pattern of pharmacy-led models that move services to the patient and expand medicine availability in primary care [127]. The third is re-engagement with primary care, in which the community team holds the recovery plan rather than a copy of the discharge letter, supported by peer and caregiver networks that address the isolation clinical services handle poorly; AI-supported reintegration approaches for people experiencing homelessness in substance use recovery illustrate how such support can be structured for the most excluded [128]. The fourth is scheduled re-estimation of risk (T4), since the patient re-enters Phase 1 with a higher risk profile, and the commonest failure is to treat discharge as a return to the pre-admission state. Success in this phase is not a completed plan or an attended appointment but a demonstrable reduction in the composite risk described in Section 3.8, sustained at six and twelve months. This is a harder standard than transitional care measurement that stops at thirty-day readmission, which measures the quality of the handover rather than whether the trajectory changed. Days alive and at home offers a patient-centered complement that can be computed from routinely collected data [3] and that captures both death and institutional care [2].

5.6 Medicine access as a recovery constraint

Medicine access receives separate treatment because it is most often assumed and least often secured. A recovery plan that does not verify medicine availability has specified an intervention whose delivery is unverified. Narrative reviews of pharmaceutical supply chain inefficiency and medication affordability in resource-constrained systems [24] and of supply chain governance and environmental risk management in emerging markets [36] show that access, affordability and resilience form one problem rather than three. Availability fails at identifiable points: last-mile distribution to underserved communities [51]; inventory management amenable to lean process improvement [129,130]; end-to-end visibility across the chain [131]; supplier relationship management [132]; the absence of real-time risk assessment dashboards [133]; manufacturing quality assurance as a determinant of supply reliability [134]; cold chain integrity for temperature-sensitive products [135]; and the absence of early warning for shortages of essential medicines [52]. Automation and digital twins have been proposed to reduce procurement errors and turnaround time [136], distributed ledgers to strengthen supply chain traceability [137], and formulation technologies, from nanomaterial-based delivery [138] to cost-

effectiveness modeling of botanical compound preparation [139], alter what can be supplied and at what cost. Quality failure reaches the same endpoint by another route. Substandard and falsified medicines undermine treatment silently, and field-deployable detection methods are the main defense [140,141]. Medicine quality failure has been linked to the emergence and spread of antimicrobial resistance, converting individual treatment failure into population risk [142]. Each of the following protects a different segment of the chain: traceability and chain-of-custody integrity [143]; risk-based decision-making in good manufacturing practice [144]; effective corrective and preventive action [145]; risk-based interdiction of illicit imports [146]; data integrity in regulated operations [147]; regulatory harmonization, both global [148] and across African pharmaceutical markets [149]; risk-based accelerated approval [150]; regulatory readiness for market entry [151]; and pricing and market access, including value-based pricing [63] and the commercial effects of biosimilars [152]. For the high-risk survivor these are not remote regulatory concerns. They decide whether the anticoagulant, inhaler or antimicrobial on the discharge list is present, genuine and affordable in the month after discharge.

5.7 Enabler A: Integrated data infrastructure

The phases describe what should happen; the enablers describe what must exist for it to be possible. Attempting the phases without them produces a pattern familiar from integrated care pilots: locally successful, individually heroic, and not sustained after the champion leaves. Enabler A is a longitudinal, bidirectional record spanning acute physiology and community and social context, whose architecture treats interoperability, data quality and analytics as one problem [22]. Bidirectionality is the non-obvious requirement. Most efforts push acute data outward at discharge, while the framework requires community and social data to flow inward at admission, which is harder and less popular because the acute system usually controls the investment. Minimum requirements are shared patient identity across settings; structured pre-admission functional and social status accessible at the bedside; two-way event notification; outcome capture that does not terminate at discharge; and analytic capability sufficient to convert the record into a re-estimated risk state rather than an archive, drawing on data-driven lifecycle performance models [65] and real-world evidence methods [21]. Governance is part of the enabler, not an addition to it. Social data are sensitive and can stigmatize patients. Systems should collect only information linked to a defined service response, explain who can access it, and allow correction. Sensitivity classification and regulatory traceability [56], compliant architectures and secure analytics for community healthcare organizations [41], and governance of data lakehouse architectures for loss prevention [153] describe the technical controls. Privacy-preserving governance models comparing blockchain and cryptographic strategies across health systems [55], legal and ethical risk modeling in data protection governance [154], comparative data protection regulation and secure cloud implementation [155], harmonization of compliance across the General Data Protection Regulation, Nigerian and United States regimes [42], and privacy governance for cross-border digital platforms [156] describe the legal layer. Privacy by design, developed for corporate restructuring [157], offers a transferable principle: protection must be specified before data are combined, not retrofitted afterward. Security is the condition under which a bidirectional record remains trustworthy. Structured frameworks for protecting clinical records in regulated environments [158], identity-centric zero-trust architecture [159], incident response and digital forensics for rapid containment of attacks [160], and quantification of cyber risk to prioritize security investment [161] all bear on whether a record holding clinical and social data can be defended. Human factors matter as much as architecture; an integrative

review of cybersecurity awareness training for university administrators found that insider-threat behavior is shaped by training design [162], a lesson that transfers to the many non-clinical staff who will handle social data. On-device small language models designed for privacy-preserving inference [163] suggest one route to analytics that do not require centralizing the most sensitive fields. Governance should name the responsible organization, the retention period, the audit trail and the route by which patients can decline nonessential collection, and evaluations should report both screening and successful service connection.

5.8 Enabler B: Aligned financing and accountability

Enabler B addresses the financial mismatch described in Section 3.4: the costs and benefits of prevention land on different balance sheets. Three alignment mechanisms are available, in ascending order of difficulty and potential effect (Table 4). None is sufficient alone, and each has a characteristic failure mode that the framework's measurement model is designed to detect. The choice among them depends less on theoretical merit than on the size of the attributable population, the maturity of risk adjustment and the trust between payer and providers, which is why reviews of provider payment reform emphasize the conditions of implementation over the design of the instrument [11].

Table 4. Financial alignment mechanisms for integrating critical care and population health, with principal limitations.

Mechanism	How it aligns incentives	Principal limitation	Measurement safeguard in the framework
Shared savings on an attributed population	Gives the preventing entity a share of avoided acute cost	Attribution disputes; slow realization; weak for small populations	Transition indicators reported jointly by both sectors
Bundled payment extended beyond the episode	Extends acute accountability into recovery	Arbitrary boundaries; incentive to shift patients out of the bundle	Outcome capture beyond the bundle window (days alive and at home)
Population-based capitation with outcome accountability	Removes the internal boundary between acute and community budgets	Requires scale, risk adjustment and trust; risk of under-provision if outcome measurement is weak	Equity-stratified outcome reporting as a funding condition

Whichever mechanism is used, the framework requires a single entity accountable for the population's trajectory across all four phases; without it, each phase optimizes locally and the transitions stay broken. That entity must also control the levers on which the outcome depends, a condition that payment reform alone rarely secures [11]. Strategic change models derived from large programs indicate how such accountability is established and how it fails [12], and strategic frameworks for resilient health systems locate the answer in organizational strategy and operations rather than payment design alone [46]. Capital financing matters equally, because the physical capacity on which the framework depends has to be built and maintained. Cost control and financial accountability frameworks for national healthcare construction programs [164], governance and accountability models for public-private partnerships in healthcare infrastructure

[165], quantitative risk architectures for allocating public and private risk in such partnerships [166], and performance metrics for long-term asset management [167] determine whether diagnostic and treatment capacity is delivered and then sustained.

5.9 Enabler C: Workforce and cultural competency

The framework asks people to work across professional boundaries, which is sustainable only if those boundaries are formally redrawn. Enabler C requires boundary-spanning roles with authority in both systems, and cross-domain training in which intensivists learn population health reasoning and community teams learn the sequelae of critical illness. Data-informed digital learning platforms [43] and real-time performance dashboards in health professional training [57] provide delivery mechanisms. Equity in workforce development matters because access frameworks for underrepresented learners in clinical training determine who enters these roles [44], and governance of data in digital learning systems protects learners while enabling the analytics that improve training [168,169]. Leadership capacity, examined for nurse leaders in residential care facilities [170], is a prerequisite for sustaining cross-boundary work once initial enthusiasm fades. Analytic literacy is the third workforce requirement. Productivity and workflow models depend on staff who can interpret them [171]. Preserving critical thinking where generative AI enters learning [172] and redesigning assessment to certify authentic human competency [173] are training objectives with direct clinical parallels, since a risk score accepted without judgment becomes a decision rule by default. Workflow automation frameworks for small healthcare practices show that coordination gains do not require enterprise-scale systems [174]. Integration work is real work, and adding it to existing roles without adjusting staffing is a decision not to do it [114]. Meta-analytic evidence on compressed workweeks shows that redesign of working time has measurable operational and psychosocial consequences [175], and structured safety training models from high-hazard industries offer a transferable template for the protocols that boundary-spanning staff will need [176]. The three enablers fail together. Data without financing produces dashboards nobody acts on; financing without data produces accountability for outcomes nobody can measure; and both without workforce produce capable systems with nobody to run them.

5.10 Adaptation to resource-constrained health systems

The framework as described assumes baseline capacity in primary care, diagnostics, community services and data infrastructure. Where that assumption fails, the model would be worse than useless if it implied that integration must wait for capacity to arrive. The four-phase structure does not change, because it describes the trajectory of illness rather than the configuration of a system. What changes is the binding constraint at each phase and therefore the sequence of investment (Table 3): absence of routine contact with at-risk populations in Phase 1, diagnostic turnaround in Phase 2, absence of rehabilitation in Phase 3, and medicine availability in Phase 4. Where laboratory capacity is limited, the peri-critical phase cannot function, because the information on which acute decisions depend does not exist. Sustainable laboratory infrastructure models address this [47], and infrastructure-driven expansion of diagnostic access into underserved and rural regions relieves the constraint [48]. Design decisions then determine sustainability. Materials selection and energy efficiency affect operating cost and therefore continuity of service [177]; risk-managed construction determines whether complex regulated facilities are delivered at all [178]; lifecycle evaluation allows capacity to scale rather than remain bespoke [90]; digital and building information modeling methods improve coordination

in delivering complex medical facilities [179]; design standards for blood collection networks determine whether transfusion support exists [180]; healing-centered design principles shape the environment in which diagnosis and recovery take place [181]; and high-performance laboratory design [182] and resilience planning for national diagnostic systems under public health stress [183] determine whether any of it survives a surge. Where specialist rehabilitation does not exist, Phase 3 falls to whoever is present. Nurse-led models are the most credible route, supported by evidence of effects on outcomes among community-dwelling older adults with dementia [94], and data-driven preparedness frameworks for urban hospitals illustrate how structured protocols can organize response where specialist capacity is thin [184]. Telehealth extends reach where physical services are thin, but a systematic review of AI-powered remote monitoring identifies user trust, privacy and regulatory governance as the conditions that determine whether the reach is accepted [53]. The equity risk runs both ways: digital channels reach some populations that facilities do not and exclude others that facilities do. Research on AI in multilingual and accessible emergency alerting [185], a trust-centered model for AI-driven multilingual emergency communication [186], and a framework for accessibility and equity in AI-driven public safety systems [187] address the same problem in a different sector, including multilingual delivery and trust in automated messages. Parameter-efficient multilingual adaptation of on-device language models makes such delivery feasible where bandwidth and hardware are constrained [188]. Integration in constrained settings often depends on external partnership, whose contribution and coordination burden are both documented in global efforts against parasitic disease [189]. Resilient humanitarian logistics that combine predictive analytics with localized distribution [190], and localized supply chain models for community development [191], show how domestic capability can be built rather than dependency deepened.

5.11 Relation to adjacent models

The Continuum of Critical Risk overlaps with several established models, and its distinctiveness should be stated precisely. The Chronic Care Model organizes proactive ambulatory care around productive interactions between an informed patient and a prepared team, supported by community resources, decision support and clinical information systems [16]. The framework adopts that system-level view but differs in treating the acute admission as a phase of the same process rather than an interruption of it. The ABCDEF liberation bundle organizes in-unit practice to limit sedation, delirium and immobility and to engage families [1]; the framework adopts it as the core of Phase 2 but relocates its rationale from length of stay to the population's functional trajectory. Care-coordination and transitional care frameworks concentrate on the handover from hospital to home [17]; the framework treats that handover as one of four transitions and insists that the other three, especially the arrival of population context at admission, are at least as consequential. The framework differs from all three in five respects: it is bidirectional; it positions the unit as a producer as well as a consumer of population risk; it sets accountability at the population rather than the episode; it locates leverage in transitions rather than within phases; and it holds diagnostic, pharmaceutical and infrastructural limits inside the model as variables, which is what makes it portable to constrained settings [24,47].

6. Propositions, Operationalization and Measurement

6.1 Six testable propositions

A framework that cannot be wrong cannot be useful. Six propositions follow from the premises in Section 4.6 and the architecture in Section 5 (Table 5). Each is stated so that a plausible study

could refute it, and each is paired with the level of analysis at which it should be tested. Proposition 1 concerns the location of leverage: among high-risk patients, performance on transition indicators should explain more of the variation in days alive and at home and in functional trajectory than performance on within-phase process indicators. Proposition 2 concerns the level of analysis and follows from the pattern of null trials of post-ICU services [25-27]: recovery interventions should show benefit when delivered with control over the determinants of recovery (rehabilitation access, medicine access and social needs) and evaluated at population level, and should continue to show little benefit when delivered as standalone acute-sector clinics. Proposition 3 concerns the enablers: the effect of any phase intervention should be conditional on all three enablers, so that their interaction is multiplicative rather than additive. Proposition 4 concerns bidirectional data: structured pre-admission functional and social baseline available at admission should change decisions about escalation, discharge destination and rehabilitation, and reduce discordance between documented preferences and care received [22]. Proposition 5 concerns capacity: in constrained settings, investment in the phase-specific binding constraint should yield larger outcome gains than equal investment in non-binding components [47]. Proposition 6 concerns equity: introducing population risk scores into acute pathways without safeguards should produce a gradient in escalation intensity by social risk stratum, and that gradient should be absent where scores are barred from automated treatment limitation and escalation is audited [29].

Table 5. Six falsifiable propositions derived from the framework, with the evidence that would refute each.

Proposition	Statement	Refuted if	Level of analysis
P1 Transitions	Transition indicator performance explains more outcome variation than within-phase process performance	Within-phase indicators explain equal or greater variation in days alive and at home [2]	Health system or network
P2 Level of analysis	Recovery interventions with control over recovery determinants show benefit; standalone clinics do not [25,27]	Standalone clinics and integrated pathways show equivalent effects	Population served by an accountable entity
P3 Enabler interaction	Phase interventions are effective only where all three enablers are present	Phase effects are similar where one enabler is absent	Comparative across systems
P4 Bidirectional data	Structured baseline at admission changes escalation, discharge and rehabilitation decisions	No change in decisions or goal-concordance after implementation	Hospital, stepped implementation

Proposition	Statement	Refuted if	Level of analysis
P5 Binding constraint	Investment in the phase-specific binding constraint yields larger gains than in non-binding components [48]	Equal or larger gains from non-binding investment	Region or national program
P6 Rationing by proxy	Unsafeguarded risk scores produce an escalation gradient by social stratum; safeguards remove it [29]	No gradient without safeguards, or a persistent gradient with them	Hospital or network, audited

6.2 Implementation sequence

No system implements all four phases at once, and the order of implementation matters because the phases depend on one another. A dependency-ordered sequence begins by defining and counting the high-risk cohort using the three axes in Section 3.8. At this point systems routinely discover that their social data are absent or unusable, which is itself a finding. The second step instruments the transitions before improving any phase, since transition failure is usually larger than failure within phases and invisible to existing dashboards; the logic mirrors the use of real-time performance analytics to expose decision delays in hospitals [58]. The third step establishes a minimum bidirectional data link [22]. The fourth builds Phase 3 first, because it has the clearest accountability vacuum and the shortest feedback loop. The fifth extends backward into Phase 2 and outward into Phases 1 and 4. Financing is aligned last, because payment reform ahead of operational capability creates accountability for a service that cannot yet be delivered, a failure pattern that analyses of large transformation programs describe [12]. This sequence is itself a hypothesis, and the evaluation agenda in Section 7.9 treats it as one.

6.3 Measurement model

Measurement follows the same structure as the framework, with phase-specific process indicators, transition indicators and population outcomes (Table 6). The transition indicators are the distinctive contribution, because they are largely absent from current systems. Days alive and at home at 180 days is proposed as the primary population outcome because it integrates mortality, institutional care and readmission in a single patient-centered measure, has been validated from routinely collected data [3], and is associated with long-term function after critical illness [2]. Two principles govern the model. No indicator should be reportable by one sector alone, because single-sector indicators reconstitute the silos the framework is designed to dissolve. Equity stratification is not an optional secondary analysis, because an intervention that improves the mean while widening the gap has failed on the framework's own terms, as governance analyses of geriatric quality measures emphasize [28]. The time points in Table 6 are proposed specifications for evaluation, not empirical thresholds, and should be calibrated locally.

Table 6. Proposed transition-centered measurement model: phase process indicators, transition indicators and equity-stratified population outcomes, with the sectors that must report each jointly.

Level	Indicator	Sectors that must jointly report
Phase 1 process	Proportion of the high-risk cohort with a documented, dated response to identified social needs, not screening alone	Primary care, community services
Phase 1 process	Proportion with advance care planning completed in the community	Primary care
Transition T1	Proportion of ICU admissions with pre-admission functional and social status available within 24 hours	Community services, ICU
Phase 2 process	Delirium-free and coma-free days; mobilization within 72 hours; median turnaround for decision-critical tests [1,93]	ICU, laboratory
Transition T2	Proportion of discharge summaries recording new deficits and unit-initiated medicines with a review date	ICU, ward
Phase 3 process	Proportion with functional assessment benchmarked against recorded baseline before ward discharge	Ward, rehabilitation
Transition T3	Proportion with a named accountable receiving clinician and contact within 14 days	Hospital, primary care
Phase 4 process	Proportion receiving rehabilitation in a setting matched to access constraints; proportion with verified medicine availability at 30 days	Primary care, pharmacy, rehabilitation
Transition T4	Proportion with risk re-estimated and Phase 1 plan updated within 90 days of discharge	Primary care, accountable entity
Population outcome	Change in composite risk at 6 and 12 months; days alive and at home at 180 days [2,3]	Accountable entity

Level	Indicator	Sectors that must jointly report
Population outcome	Absolute and relative equity gap in each of the above, by deprivation and by ethnicity [28]	Accountable entity

6.4 Evaluation designs matched to the level of analysis

The choice of design follows from the propositions. Because the framework's interventions act at the level of systems and transitions, individually randomized trials of single components will tend to reproduce the null results already observed for standalone follow-up services [26]. Cluster-randomized and stepped-wedge designs at the level of the accountable entity are better suited to Propositions 1, 2 and 4, since they allow the intervention to include control over recovery determinants and permit population outcomes to be measured. Where randomization is infeasible, as for payment reform or capital investment, quasi-experimental designs using routinely collected data (interrupted time series, difference-in-differences and synthetic controls) are appropriate, and real-world evidence methods provide the analytic standards on which both critical care and population health audiences can agree [21]. Proposition 3 requires comparative designs across systems that differ in enabler configuration, and Proposition 6 requires prospective audit of escalation decisions stratified by social risk. Process evaluation should accompany every design, reporting fidelity at each transition, since systematic review has found that post-ICU complex interventions are often poorly specified in their development and implementation [20]. Qualitative work with survivors and caregivers should run alongside, because the services patients report as missing are a direct test of whether transitions are working [69].

7. Discussion

7.1 Principal contributions

This paper has argued that the gap between critical care and population health is structural, not attitudinal, and has proposed a framework that treats the gap itself as the object of design. Three contributions distinguish it from adjacent work. First, it reframes the ICU as a producer as well as a recipient of population risk, which follows from the PICS and chronic critical illness literatures [8,31] and gives the acute sector a direct stake in the long-term trajectory. Second, it locates leverage in transitions and specifies what must pass at each one, turning a general exhortation to coordinate into a set of checkable artifacts and indicators. Third, it places diagnostic, pharmaceutical and infrastructural capacity inside the model, so that the same framework prescribes different investment sequences in different settings [23,24]. The framework is not a claim that integration improves outcomes. It is a structure in which that claim can be tested, through the propositions and designs set out in Section 6. Coherence is not feasibility, and the sections that follow distinguish structural barriers external to the model, tensions internal to it, and hazards it creates.

7.2 Re-reading the null results of post-intensive care services

Trials and reviews of follow-up services after ICU discharge have generally not shown clear benefit [25-27], and meta-analyses of enhanced post-ICU physical rehabilitation [61] and psychological follow-up [62] have been cautious. The framework offers an interpretation rather than a defense. Such services were typically evaluated as standalone acute-sector interventions,

providing recognition of impairment without control over the determinants of recovery. A clinic that identifies severe weakness in a patient who cannot reach rehabilitation, cannot afford medication and lives alone has diagnosed the problem without acquiring the means to treat it. Continuity frameworks for equitable access to chronic therapies show pathways failing at the point of supply rather than recognition [126], and survivors themselves report that coordination and ongoing support are what they lacked [69]. On this reading, the negative results are evidence of evaluation at the wrong level of analysis rather than evidence that follow-up is valueless. The reading is itself testable: Proposition 2 predicts that the same content, delivered with accountability across Phases 3 and 4 and measured at population level, will show effects that standalone clinics have not. If it does not, the framework's account of the null results is wrong.

7.3 Structural barriers

Six structural barriers recur, each with a partial answer. Fragmented financing persists because savings accrue to a different budget holder than the one funding prevention; the partial answer is shared savings or population budgets [11]. Data governance and interoperability barriers persist through privacy concerns and an unclear legal basis for sharing social data; the answer is purpose-limited agreements with patient-facing transparency [42]. Professional identity obstructs integration because the work maps to no specialty boundary or reward structure; the answer is boundary-spanning roles with recognized career paths. Measurement lag persists because trajectory outcomes take years and funding cycles take one; the answer is intermediate transition indicators. Acute-sector dominance persists because acute services command capital and political salience; the answer is to score acute performance partly on population outcomes. Finally, diagnostic and supply capacity answer to neither clinical nor population governance; the answer is joint planning against population need [32]. None of these answers is new, and none is sufficient alone. Their value within the framework is that each is attached to a specific enabler and a specific transition, so that a system can see which barrier is binding for it and in what order to address them.

7.4 Unresolved tensions

Three tensions are internal to the framework and cannot be designed away. The first is targeting against universalism. Targeting the concentrated high-risk segment is efficient but may widen inequity, since people at moderate risk with fewer resources receive nothing; proportionate universalism, the usual proposed resolution, is more expensive and harder to defend against demands for measurable return [14]. The second is prediction against labeling. Identifying someone as high risk enables help and creates a label capable of influencing clinician expectations, insurance treatment and, at worst, the vigor of the intervention offered. The third is efficiency against obligation. Justification by cost savings collapses the moment savings fail to materialize, and it implies that expensive patients unlikely to generate offsetting savings are a lower priority. The framework therefore rests its justification on outcomes and obligation rather than savings, consistent with strategic frameworks that treat resilience and equity as goals of health system strategy in their own right [46]. Naming these tensions matters because implementations that do not name them tend to resolve them silently, usually in favor of efficiency.

7.5 Equity considerations

Equity is treated here as a design requirement rather than a secondary concern, and three hazards require explicit safeguards. The first is algorithmic bias. Historical utilization and diagnostic data can reproduce unequal access, as the cost-as-proxy failure demonstrated [29]. Before an alert routes a patient to intervention, teams should compare calibration, false-negative rates and actual service receipt across groups. Missing social data must remain visible, since a missing screen is not evidence that a patient has no need. Clinical review should permit override, record its reason, and examine whether overrides differ by group. External validation is necessary before thresholds are transferred to another hospital or community. Cross-sector governance work supplies the accountability tools: model risk management in financial services [192], AI-assisted compliance monitoring and anomaly detection [193], responsible AI governance structures for automated decision systems in regulated industries [40], and organizational readiness for the European Union Artificial Intelligence Act [194]. Automated model evaluation raises its own risks, including bias in automated judging of model outputs [195], vulnerabilities of agentic AI workflows to manipulation [196], and the dependence of model behavior on how training data are curated [197]. Reviews of AI as a force multiplier in clinical decision-making identify the same implementation risks inside health systems [198], and tension between algorithmic accountability and trade-secret protection can limit the transparency that audit requires [199].

The second and most serious hazard is rationing by proxy: importing population-level prognostic information into individual acute triage. A trajectory-informed system can slide, without anyone deciding it should, into one where a low predicted recovery score reduces the intensity of care offered. Because those so scored are disproportionately poor, disabled or marginalized, population risk data would then allocate less care to those already receiving least. The framework therefore constrains itself. Population context may inform conversations about goals, prognosis and planning, and it may not be an automated determinant of treatment limitation. Analyses of automated decision-making under United States anti-discrimination law show that such uses carry legal as well as ethical exposure [54]. Systems should audit escalation by social risk stratum and treat any gradient as a defect in the system rather than a property of the patients. The third hazard concerns consent and surveillance. Assembling clinical, utilization and social data on people with the least power to refuse is a capability that can be used well or badly. Patients should know what is held, why and who can see it, and should be able to decline sharing of social data without losing clinical care. A framework that cannot survive that condition is not an integration framework but a monitoring system, and should be evaluated as one [98].

7.6 Implications for practice

Four implications follow for those running services. First, the highest-value change available to most acute units is not a clinical intervention but a new structured field in the record: units that cannot say what a patient's baseline was cannot say whether that patient has recovered. Capturing pre-admission function and social status at admission is inexpensive and directly supports Proposition 4 [22]. Second, discharge documentation should be rewritten around loss rather than activity, recording new deficits, exposures such as delirium and ventilation, and medicines started in the unit with review dates, so that the T2 transition carries what the receiving team needs. Third, accountability should be assigned to a person rather than a service, because distributed responsibility is indistinguishable from none; care-coordination frameworks for readmission reduction reach the same conclusion from the ward side [17]. Fourth, services should verify rather than assume the conditions their plans depend on. Medicine availability,

access to rehabilitation and assistance at home are checkable facts, and last-mile distribution research shows how often the first of these fails for underserved communities [51]. Each implication can be adopted without new payment models or large capital investment, which makes them suitable first steps in the implementation sequence in Section 6.2.

7.7 Implications for policy

Six policy implications follow. First, fund the transitions. Integration funding typically flows to services within phases, while transition capability, including notification systems, boundary-spanning roles and shared records, belongs to no department and is chronically underfunded [12]. Second, extend acute accountability past discharge, so that providers answer for a defined post-discharge window on functional and equity measures rather than readmission alone; days alive and at home offers a feasible metric [3]. Third, make equity-stratified reporting a condition of public funding [28]. Fourth, regulate stratification tools used for resource allocation, making transparency about outcome labels, published subgroup performance and human override regulatory requirements rather than voluntary standards [40,54]. Fifth, plan diagnostic and supply capacity against population need, linking capital programs for laboratories and supply chains to where high-risk patients live [23,32,129]. Sixth, invest in social infrastructure as critical care policy. Treating housing, food and income security as outside the health policy frame is a category error that social determinants research has long identified [10] and that the framework is intended to correct at the level of the ICU.

7.8 Limitations

The limitations concern both the evidence and this paper. On the evidence side, the underlying literatures are unevenly strong. PICS and chronic critical illness rest on substantial empirical work [6,8,31], whereas integrated intervention across the full continuum does not, and many sources from infrastructure, supply chain and governance fields are conceptual frameworks rather than evaluations; they were used as analogues and design precedents, not as evidence of clinical effect. On the paper's side, six limitations bound the claims. The framework is unvalidated, and internal coherence is not evidence of effectiveness. The implementation sequence in Section 6.2 and the adaptation logic in Section 5.10 are reasoned rather than demonstrated. Partial implementation is the realistic case, and the framework does not yet specify which configurations retain most of the benefit. The definition of high risk remains operationally underspecified, introducing exactly the discretion that Section 7.5 identifies as a source of bias. The synthesis was integrative rather than systematic, so a different corpus might have produced the same temporal structure with different emphases among the enablers. Finally, the framework was developed with attention to both high-income and resource-constrained systems [24,47], but its constructs have not been tested for acceptability with patients, caregivers or front-line staff in either.

7.9 Future research agenda

The agenda follows the propositions and is summarized in Table 7. Priority lies with studies that can refute the framework's most consequential claims: that transitions carry more leverage than phases, that recovery interventions fail when evaluated at the wrong level of analysis, and that population risk data can enter acute pathways without producing an escalation gradient. Methodological work is needed on a validated composite risk measure spanning the three axes, on standards for structured capture of pre-admission function and social status, and on attributing

population outcomes to accountable entities that span acute and community sectors [21]. Implementation research should examine which partial configurations retain most of the benefit and how the dependency-ordered sequence performs in practice, using process evaluation to report fidelity at each transition [20]. Research in resource-constrained settings should test whether investment in the phase-specific binding constraint outperforms investment elsewhere, using quasi-experimental designs on routinely collected data where randomization is infeasible [48]. Across all of these, equity should be a primary outcome, and patients and caregivers should shape the choice of outcomes [69].

Table 7. Research agenda linked to the framework's propositions: priority questions, suggested designs and primary outcomes.

Priority question	Suggested design	Primary outcome	Linked proposition
Do transition indicators explain more outcome variation than within-phase indicators?	Multilevel observational study across health systems	Days alive and at home at 180 days [2]	P1
Does an integrated Phase 3 and 4 pathway outperform a standalone follow-up clinic?	Cluster-randomized trial at the level of the accountable entity	Functional trajectory at 6 and 12 months [26]	P2
Are phase effects conditional on all three enablers?	Comparative case study and cross-system analysis	Phase-specific process and population outcomes	P3
Does structured pre-admission baseline change acute decisions?	Stepped-wedge implementation across hospitals	Goal-concordant care; discharge destination	P4
Does investment in the binding constraint yield larger gains?	Interrupted time series or synthetic control in regional programs	Diagnostic turnaround; verified medicine availability; outcomes [47]	P5
Do population risk scores in acute pathways produce an escalation gradient?	Prospective audit with and without safeguards	Escalation intensity by social risk stratum [29]	P6
Which partial configurations retain most of the benefit?	Realist evaluation of implementation sites	Mechanisms and outcomes by configuration	P1 to P3

8. Conclusion

Critical care and population health have each succeeded on their own terms and are each now limited by the boundary between them. Critical care has reduced short-term mortality and produced a population of survivors whose long-term outcomes it is not structured to address; population health has identified where risk concentrates without a route into the acute setting

where that risk is most visibly expressed. The Continuum of Critical Risk framework proposes that these are two views of one problem. It treats critical illness as the acute expression of accumulated population risk and as a generator of new population risk, and it locates leverage in the transitions between phases. It specifies four phases, three enablers, an explicit treatment of diagnostic, pharmaceutical and infrastructural constraints, a transition-centered measurement model, and six propositions that can be tested and found wrong. Whether integration improves outcomes is an empirical question the framework does not answer. What it offers is a structure precise enough for that question to be asked properly: the level of analysis matched to the intervention, the follow-up horizon matched to the trajectory, capacity constraints stated rather than assumed, and equity consequences measured rather than asserted. The alternative is the current arrangement, in which two systems do competent work on either side of a gap that neither is accountable for, and a group of patients falls through it repeatedly.

Declarations

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