

Research Article

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Cumulative Secondary Dysautonomia, Recovery Trajectories, and Clinical Recovery Flags An Integrated Framework for Longitudinal Autonomic Assessment Linking BRR Theory, MSAD, ALAS/ALI, the Recovery-Weighted Model, RWCAM, and Clinical Recovery Flags

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Abstract

Background: Autonomic assessment is often organised around the clinical snapshot: the symptom score, haemodynamic result, laboratory severity grade, or diagnosis visible at one encounter. These measurements are essential, but they may not reconstruct the cumulative pathway by which multifactorial secondary dysautonomia developed, show how resilience and reserve shaped its expression, distinguish restoration from compensation, or represent asynchronous recovery across organ systems.

Problem: Existing tools measure autonomic symptoms, laboratory-confirmed failure, or defined haemodynamic syndromes. No single established approach represented in the literature considered here combines the chronology of multiple secondary contributors, changing adaptive capacity, eight-domain autonomic burden, evidentiary confidence, recovery direction, recovery velocity, domain-specific stages, and candidate early signals of network repair.

Original Contribution: This paper consolidates a linked programme of original secondary-dysautonomia scholarship. BRR Theory explains how cumulative burden may exceed resilience and remaining autonomic reserve. The proposed Multifactorial Secondary Autonomic Dysfunction (MSAD) phenotype gives that cumulative pattern a bounded clinical formulation. ALAS/ALI converts present burden into an eight-domain profile while separating severity from confidence. The Recovery-Weighted Model interprets the biological and functional meaning of change; RWCAM supplies a repeatable longitudinal language; and five candidate clinical recovery flags make early network-level improvement observable and prospectively testable. The conceptual system is operationalised in a six-part, research-use-only Clinical Working Cameo Suite that provides linked worksheets for chronology, phenotype formulation, burden profiling, recovery-weighted interpretation, longitudinal staging, and prospective recovery-flag observation.

Implications: The integrated framework makes several clinically consequential distinctions explicit: cumulative coherence is not proof of causation; burden is not certainty; symptom reduction is not necessarily physiological recovery; compensation is not restoration; apparently stable function may depend on increasing support; and different autonomic domains may recover, plateau, or deteriorate at different rates. It offers a structured research and clinical-reasoning agenda rather than a diagnostic, prognostic, or treatment instrument.

Conclusion: The originality of the work lies not in claiming that burden, resilience, reserve, function, or longitudinal assessment are individually unknown. It lies in arranging these concepts around a neglected clinical object: cumulative, multisystem secondary dysautonomia whose development and recovery cannot be represented adequately by one diagnosis, one organ, one score, or one encounter. Independent expert review, co-design, psychometric development,

prospective multisystem testing, and external validation are now required. The six companion cameos make that architecture auditable and prospectively testable without converting it into a diagnostic, prognostic, or treatment system.

Keywords: Secondary Dysautonomia, Autonomic Burden, Physiological Reserve, Resilience, Msad, Alas, Autonomic Load Index, Recovery-Weighted Assessment, Recovery Trajectory, Clinical Recovery Flags, Longitudinal Assessment, Lived-Experience Scholarship

Statement of originality and scope. *The distinctive contribution of this paper is the proposed integration of cumulative secondary autonomic causation, present multidomain burden, changing resilience and reserve, evidentiary confidence, recovery direction, and candidate recovery signals within one longitudinal autonomic reasoning system. This is an originality claim about conceptual architecture, not a claim of validation, universal priority, diagnostic authority, or clinical superiority. A formal scoping review and empirical comparison are required before any stronger claim is justified.*

Companion Clinical Working Cameo Suite

This synthesis is accompanied by a six-part Clinical Working Cameo Suite. The cameos are investigational, research-use-only operational worksheets. They do not create new diagnoses or substitute for recognised autonomic assessment. Their purpose is to make each hand-off in the conceptual architecture explicit, bounded, reproducible, and capable of prospective testing. The

intended sequence is: Cameo 1, chronology and reserve, Cameo 2, phenotype formulation, Cameo 3, multidomain burden, Cameo 4, recovery-weighted interpretation, Cameo 5, longitudinal staging and vector, and Cameo 6, prospective recovery-flag observation. Each worksheet can be used separately when clinically or methodologically appropriate, but the full suite is designed as a connected reasoning pathway.

Interactive online companion
Clinical Working Cameo Suite — all six investigational worksheets in one 26-page flipbook.
[Open the online flipbook](https://heyzine.com/flip-book/9a8c9a8949.html)
<https://heyzine.com/flip-book/9a8c9a8949.html>

Cameo 1 of 6 — Burden-Resilience-Reserve (BRR) Working Model. Reconstructs the sequence of secondary insults and recovery opportunity, then tests residual burden, resilience, reserve, threshold behaviour, and compensation versus restoration. [Open Cameo 1](#)

Cameo 2 of 6 — MSAD Candidate Phenotype Formulation. Tests whether coherent autonomic dysfunction, multiple plausible secondary contributors, temporal/biological coherence, exclusions, and added explanatory value justify an MSAD research formulation. [Open Cameo 2](#)

Cameo 3 of 6 — ALAS/ALI Multidomain Burden Working Instrument. Profiles present burden across eight domains using frequency, severity, functional impact, recovery time, evidentiary

confidence, and serial change. [Open Cameo 3](#)

Cameo 4 of 6 — Recovery-Weighted Model Interpretation Worksheet. Interprets what observed change may mean by separating present burden, recovery likelihood, inferred dysfunction or injury, clinical priority, trajectory, vector, and compensation. [Open Cameo 4](#)

Cameo 5 of 6 — RWCAM Longitudinal Review and Staging Record. Creates a repeatable domain-by-domain record of stage, direction, objective and functional evidence, asynchrony, confidence, priorities, support dependence, and review timing. [Open Cameo 5](#)

Cameo 6 of 6 — Clinical Recovery Flags Observation Record. Prospectively dates and tests candidate recovery signals against

recurrence, persistence, objective and functional correlates, and competing explanations. [Open Cameo 6](#)

Access and publication note. *The six companion cameos are now available together as one integrated interactive online flipbook. Hyperlinks throughout this manuscript open the consolidated six-cameo suite, allowing readers to move from the conceptual synthesis directly to the corresponding operational worksheets. The individual cameo titles, numbering, and research-use-only status remain unchanged.*

1. Introduction: the Clinical Object that Disappears Between Specialties

A score can describe the weight of today. It cannot, by itself, explain the road by which the patient arrived there, how much adaptive capacity remains, or the direction in which the person is moving. Modern autonomic medicine has rigorous tools for documenting symptoms, defining haemodynamic syndromes, and grading laboratory evidence of autonomic failure. COMPASS-31 provides a concise patient-reported measure of autonomic symptom burden, the Composite Autonomic Severity Score (CASS) grades the distribution and severity of laboratory-confirmed autonomic deficits, and consensus definitions and contemporary assessment pathways support diagnosis of orthostatic hypotension, postural tachycardia syndrome, and related disorders [1-4]. These contributions are foundational. The problem addressed here is therefore not that established clinicians believe a symptom score, blood-pressure reading, or laboratory grade is a complete diagnosis. The problem is that complex patients are frequently encountered through separate clinical windows. Cardiology sees labile pressure, gastroenterology sees dysmotility, urology sees retention, neurology sees orthostatic symptoms, rehabilitation sees fatigue and lost endurance, primary care sees a changing collection of multisystem consequences. Each observation may be accurate, yet the cumulative process and the recovery trajectory can disappear between them.

This fragmentation matters most when autonomic dysfunction is secondary, multifactorial, multisystem, and prolonged. A person may experience infection, inflammation, diabetes, cardiovascular injury, major surgery, critical-care exposure, cancer treatment,

medication effects, metabolic disruption, toxic exposure, or other physiological stressors. The contributors may be individually recognised while their cumulative interaction remains unnamed. Secondary dysautonomias after viral and systemic illness, diabetic autonomic neuropathy, critical illness, and chemotherapy demonstrate why a network and longitudinal perspective is necessary [5-21].

This paper consolidates a linked body of scholarship on cumulative autonomic burden, adaptive capacity, and recovery: BRR Theory, the proposed MSAD phenotype, ALAS/ALI, the Recovery-Weighted Model, RWCAM, and candidate clinical recovery flags [22-26]. Although developed sequentially, these works address one clinical problem. Together, they move from causal chronology to phenotype, burden measurement, interpretation of change, repeatable longitudinal recording, and, finally, observable signals that recovery may be beginning. The six conceptual components are also presented as linked companion working cameos, allowing readers to move directly from the synthesis to the corresponding operational worksheet.

2. Intellectual Method, Positionality, and Evidentiary Discipline

This is a conceptual synthesis and lived-experience-informed perspective. It draws on systems biology, network medicine, autonomic physiology, resilience and reserve science, measurement theory, and disciplined patient-investigator observation [8-18]. It does not report a prospective cohort, psychometric validation, diagnostic-accuracy study, or prognostic algorithm. The author writes as an independent scholar and as the patient whose experience generated many of the longitudinal questions. This dual position provides access to bodily experience, records, functional adaptation, and change over time that may be difficult to capture during a short consultation. It also creates risks of selection, recall, interpretation, confirmation bias, and overfitting. One deeply observed life can disclose overlooked phenomena and generate testable constructs. It cannot establish prevalence, causality, reliability, diagnostic accuracy, or generalisability.

The paper therefore adopts an explicit evidence hierarchy.

Evidentiary level	Examples in this paper	What may properly be concluded
Documented diagnosis or measurement	Cardiac tamponade during ablation, emergency sternotomy and cardiopulmonary bypass, measured orthostatic hypotension with supine hypertension, documented gastrointestinal and urinary dysfunction	These are part of the clinical history and may be integrated into formulation. Their presence does not prove one unified mechanism.
Phenomenological and functional observation	Return of sweating, shorter post-exertional recovery, renewed exercise tolerance, altered cognitive endurance, changes in motivation or sexual function	These observations are clinically relevant and may guide hypotheses and prospective measurement. They are not equivalent to direct measurement of network repair.
Evidence-supported clinical practice	Standard autonomic history, examination, symptom instruments, haemodynamic definitions, laboratory testing, functional assessment, and serial review	These practices establish recognised diagnoses and measurements. They do not, by themselves, validate the proposed cumulative or recovery-weighted architecture.
Original hypothesis or investigational construct	BRR Theory, MSAD phenotype, ALAS/ALI scoring and thresholds, recovery weighting, RWCAM stages and vectors, candidate recovery flags	These are testable proposals. They must not be presented as established diagnoses, biomarkers, prognostic tools, or treatment rules.

This hierarchy is not a rhetorical disclaimer. It is part of the method. Original scholarship becomes more credible, not less, when its boundaries are visible.

3. The Lived Clinical Problem: When Cumulative Secondary Burden has no Adequate Home

The clinical chronology motivating this work extends across almost two decades. A post-Chikungunya illness began in 2008. During a cardiac ablation in October 2021, cardiac tamponade required emergency sternotomy, cardiopulmonary bypass, and repair of the ventricular free wall. In the subsequent period, marked blood-pressure lability emerged: orthostatic falls coexisted with supine hypertension, while gastrointestinal motility, bladder function, thermoregulation, exercise tolerance, fatigue, and cognition also changed. These are not offered as proof of a new disease. They demonstrate the kind of cumulative, multisystem history that a single diagnostic label or cross-sectional score may fail to represent. The personal “three-hit” account—post-viral illness, cardiac injury, and emergency surgery with cardiopulmonary bypass—is a causal hypothesis that has not been experimentally tested. The defensible clinical observation is narrower: severe multisystem autonomic dysfunction arose after multiple documented physiological events, did not fit neatly within one specialty, and later followed an uneven course of recovery and persistence.

This experience exposed four deficits in ordinary clinical representation.

First, causal chronology was scattered across records. Each event could be named, but the timing, incomplete recovery between events, and possible interaction among them were not represented as one physiological history.

Second, multisystem burden was visible only in fragments. Cardiovascular, gastrointestinal, genitourinary, sudomotor, thermoregulatory, cognitive, fatigue, sleep, and functional consequences were assessed through different services and different vocabularies.

Third, adaptation could resemble recovery. Reduced exposure, pacing, compression, hydration strategies, mobility aids, dietary change, assistance, and carefully structured routines could preserve function without restoring underlying capacity.

Fourth, recovery had no shared language. Return of sweating, improved heart-rate responsiveness, shorter recovery after exertion, increased cognitive endurance, or renewed emotional and sexual engagement could be meaningful to the patient while remaining absent from standard summaries.

The combined scholarship was developed to make these missing dimensions explicit.

4. The Original Architecture: From Causal Accumulation to Interpretable Recovery

The originality of the dysautonomia scholarship lies in a sequence of related contributions rather than in one isolated score. Each component answers a different question, and each places a boundary around the others.

Component	Primary question	Original contribution	Essential boundary
Cameo 1 - BRR Theory	How might cumulative secondary burden alter resilience and remaining autonomic reserve?	Models time-ordered burden, changing resilience, latent reserve, threshold behaviour, and compensation versus restoration.	Systems hypothesis, not proof of cumulative mechanism or causation.
Cameo 2 - MSAD phenotype	When is a cumulative multifactorial secondary-autonomic formulation defensible?	Provides bounded phenotype logic based on coherent autonomic dysfunction, multiple plausible contributors, temporal/biological coherence, and added explanatory value.	Proposed research phenotype, not a recognised disease entity or replacement for established diagnoses.
Cameo 3 - ALAS / ALI	What is the present distribution and magnitude of autonomic burden?	Profiles eight domains, incorporates recovery time and functional impact, and separates burden from confidence.	Provisional research instrument, total score, weights, bands, and change thresholds are unvalidated.
Cameo 4 - Recovery-Weighted Model	What might observed change mean biologically and functionally?	Separates current burden, recovery likelihood, inferred dysfunction/injury, clinical priority, trajectory, velocity, vector, and compensation.	Interpretive reasoning, not a biological assay, numerical recovery weight, or individual prognosis.
Cameo 5 - RWCAM	How can longitudinal recovery be recorded consistently across asynchronous domains?	Operationalises domain stages, vectors, objective and functional evidence, confidence, patient priorities, and review intervals.	Research-use longitudinal language, not an established standard of care or one-way staging ladder.
Cameo 6 - Recovery flags	Which early changes may warrant prospective observation as possible recovery signals?	Converts lived observations into dateable, reproducible, challengeable candidate sentinel signals linked to later objective and functional outcomes.	Prompts for prospective inquiry, not specific signs, validated biomarkers, or proof of network repair.

The architecture changes the unit of analysis. Instead of asking only whether one symptom, score, organ system, or syndrome threshold is abnormal, it asks how recognised secondary insults accumulated, how resilience and reserve shaped their expression, how burden is distributed, how much function is sustained through compensation, how confident the evidence is, and whether the

longitudinal vector points towards restoration, compensated stability, fluctuation, or decline. This is not a claim that the component concepts are individually unprecedented. Burden, allostatic load, resilience, reserve, network physiology, functional assessment, and reliable longitudinal change all have established literatures [8-18]. The distinctive proposal is their arrangement

around multifactorial secondary dysautonomia: a connected system that preserves causal chronology, profiles present burden, separates burden from confidence, distinguishes restoration

from compensation, records asynchronous domain recovery, and converts lived signs of improvement into prospective hypotheses.

INTEGRATED SECONDARY-DYSAUTONOMIA SCHOLARSHIP

From cumulative clinical history to interpretable longitudinal recovery

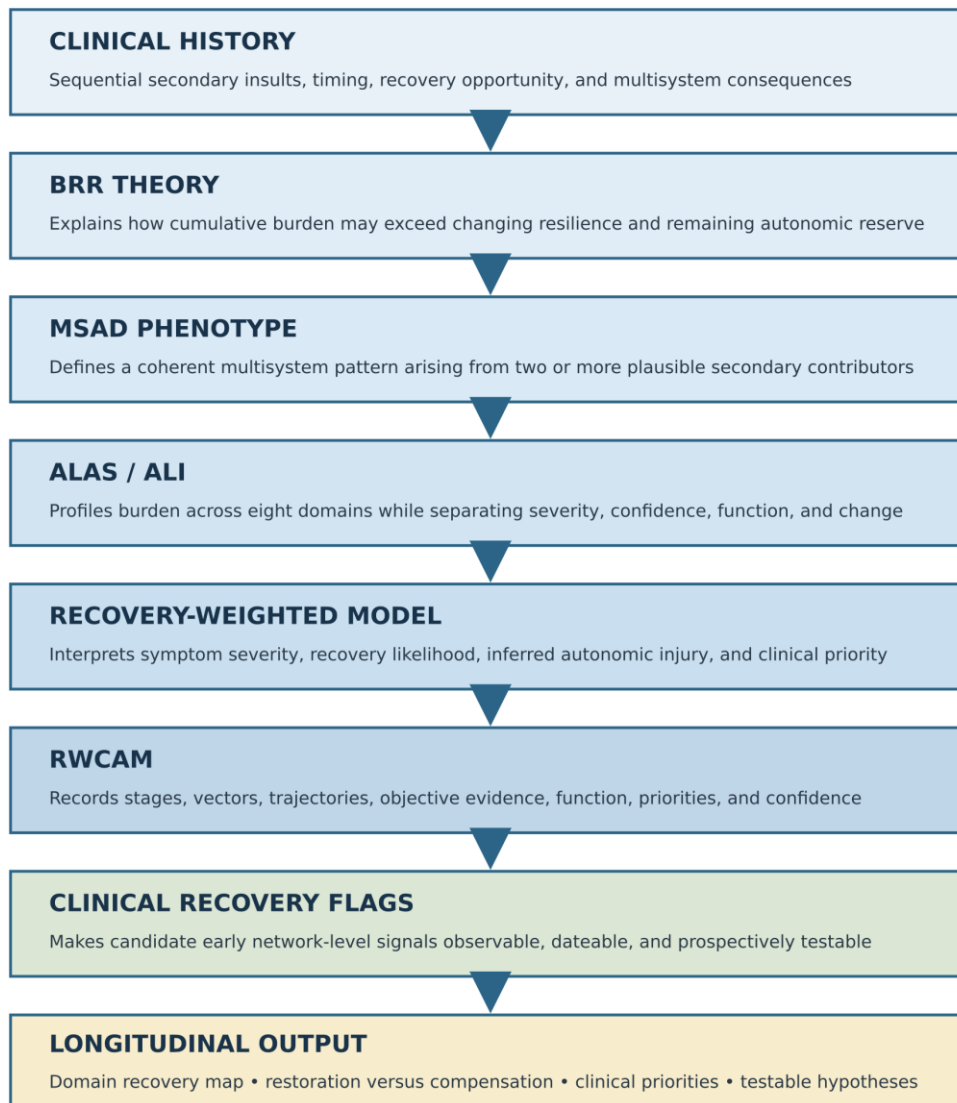


Figure 1: Integrated secondary-dysautonomia scholarship and the six companion clinical working cameos. The sequence moves from cumulative history and BRR formulation through MSAD, ALAS/ALI, recovery-weighted interpretation, RWCAM longitudinal recording, and prospective recovery flags to a bounded longitudinal output.

5. The Integrated Model: Burden, Resilience, Reserve, and Recovery Direction

5.1 BRR Theory: the Explanatory Core

Companion operational worksheet: Cameo 1 of 6 - Burden-Resilience-Reserve (BRR) Working Model. Open Cameo 1 BRR Theory begins with the autonomic nervous system as a complex adaptive regulator of cardiovascular, gastrointestinal, genitourinary, thermoregulatory, sudomotor, endocrine, immune, respiratory, and neurocognitive homeostasis. Feedback, redundancy, compensation, and network reorganisation allow substantial adaptation, but that

capacity is finite. Systems biology and network medicine support attention to interactions and propagated disturbance rather than isolated organs [8,9]. Reserve and resilience scholarship supports a distinction between present performance, the capacity to recover after perturbation, and the adaptive capacity still available under challenge [10-14]. The three BRR constructs perform different jobs. Burden is the cumulative physiological demand imposed by recognised secondary insults and their continuing consequences. Resilience is the effectiveness with which the regulatory network absorbs disturbance and regains homeostasis. Reserve is the

adaptive capacity remaining after present demands have been met - the margin that becomes visible when the person stands, exercises, eats, encounters heat, concentrates for a sustained period, or experiences another physiological challenge. Context modifies all three through age, inflammation, sleep, conditioning, nutrition, medication, comorbidity, and recovery opportunity.

Burden is therefore not a count of diagnoses. It is time-ordered and interaction-sensitive. Its effect depends on the magnitude and duration of each insult, the persistence of its consequences, the interval between insults, whether recovery was complete, and whether later events arrived after reserve had already narrowed. Several moderate insults without adequate recovery may impose more lasting network stress than one severe but fully resolved event.

BRR Theory makes six connected propositions:

- Secondary autonomic effects can accumulate. Recognised insults may remain clinically meaningful even when no one insult explains the whole phenotype.
- Resilience is dynamic rather than fixed. It can be reduced by inflammation, sleep loss, nutritional depletion, deconditioning, ageing, and repeated injury, and may improve with resolution, rehabilitation, conditioning, and restored sleep.
- Reserve is latent. A person may appear stable at rest while having little capacity to respond to orthostasis, meals, exertion, temperature, illness, or cognitive demand.
- Threshold effects may be nonlinear. A comparatively modest later insult can produce disproportionate collapse when burden is already high and reserve is low.
- Recovery may also be nonlinear. Improvement can be delayed, stepwise, or asynchronous as network coordination and reserve return.
- Compensation and restoration are not equivalent. Function may improve because exposure is reduced or support is increased even when underlying adaptive capacity remains limited [22].

These propositions give the theory empirical consequences. If BRR Theory is useful, cumulative history and pre-insult recovery opportunity should add explanatory or predictive information beyond diagnosis count and present symptom severity. Challenge-based measures should reveal reserve not visible at rest. Serial domain profiles should show nonlinear and asynchronous change. If these expectations are not supported, the theory will require revision or rejection.

5.2. MSAD: the Proposed Phenotype Generated by Cumulative Interaction

Companion operational worksheet: Cameo 2 of 6 - MSAD Candidate Phenotype Formulation. [Open Cameo 2](#)

MSAD is the proposed clinical phenotype produced when two or more biologically plausible secondary contributors interact across time and systems. It is not simply another name for severe

dysautonomia, and it is not a claim that every complex case represents a new disease. Its purpose is to preserve the recognised contributors while providing a coherent name for their cumulative expression.

The provisional logic contains four core elements:

- **Coherent Autonomic Dysfunction:** persistent objective findings or a clinically coherent autonomic syndrome, rather than a nonspecific collection of symptoms.
- **Multiple Plausible Secondary Contributors:** at least two recognised events, illnesses, exposures, or conditions capable of affecting autonomic regulation.
- **Temporal and Biological Coherence:** onset, deterioration, partial recovery, or relapse must relate plausibly to the chronology, a list of unrelated comorbidities is insufficient.
- **Added Explanatory Value:** the cumulative formulation should explain the multisystem pattern, severity, fluctuation, or recovery more coherently than any single contributor alone.

Supporting features include progressive accumulation, impairment disproportionate to one diagnosis, cardiovascular plus non-cardiovascular autonomic involvement, stress-related fluctuation, improvement as contributors resolve, and deterioration after a new insult. Exclusion boundaries are equally important: the phenotype should not be applied when one disorder adequately explains the presentation, when coherent autonomic dysfunction is absent, or when a primary neurodegenerative autonomic disorder is the principal diagnosis.

Proposed "definite," "probable," and "possible" MSAD categories are categories of evidentiary confidence, not severity, entitlement, or prognosis. This separation protects against circularity: a person should not be considered a more certain MSAD case merely because they are more disabled. The original contribution is the phenotype logic - a disciplined method for representing cumulative secondary interaction without converting that interaction into proven causation.

5.3. ALAS and ALI: Converting the Phenotype into a Multidomain Burden Profile

Companion operational worksheet: Cameo 3 of 6 - ALAS/ALI Multidomain Burden Working Instrument. [Open Cameo 3](#)

ALAS translates the theory and phenotype into a proposed assessment system. It is broader than a questionnaire: the original design comprises a patient instrument, clinician module, and scoring manual. It integrates three evidence streams - the temporal history of recognised physiological insults, patient-reported symptoms, recovery time, and functional impact, and objective or clinician-interpreted evidence. The intended output is not only a total. It includes the overall ALI, an eight-domain profile, highest- and lowest-burden domains, evidence confidence, trajectory, recovery profile, recovery velocity, and proposed review interval [23].

ALAS domain	Content the domain is designed to make visible
Cardiovascular regulation	Orthostatic tolerance, blood-pressure and heart-rate regulation, presyncope or syncope, exertional haemodynamics, and recovery after postural or cardiovascular stress.
Gastrointestinal regulation	Swallowing, gastric function, motility, post-prandial effects, bowel regulation, nutritional burden, and recovery after meals or dysmotility episodes.
Genitourinary regulation	Bladder sensation and emptying, retention, urgency or incontinence, catheter or intervention dependence, and sexual-autonomic function where appropriate.
Thermoregulatory and sudomotor function	Heat and cold tolerance, temperature instability, anhidrosis or hyperhidrosis, and environmental adaptation.
Neurocognitive autonomic symptoms	Orthostatic cognitive impairment, attention, processing endurance, cerebral-perfusion-related symptoms, and mental recovery time.
Fatigue and recovery capacity	Exertional tolerance, post-exertional deterioration, pacing, time to recover, and the capacity to tolerate repeated demand.
Sleep and circadian regulation	Sleep disruption, circadian instability, restorative quality, and interaction between sleep and autonomic symptoms.
Functional compensation and support	Adaptations, mobility aids, compression, fluid and salt strategies, care dependence, occupational limitation, and the resources required to sustain function.

Each domain is provisionally rated on four 0-4 dimensions: domain score is therefore: frequency, severity, functional impact, and recovery time. The

Domain burden = frequency + severity + functional impact + recovery time (0-16). The provisional ALI is the sum of all eight domain scores (0-128). The total must always remain attached to the domain profile, objective evidence, functional context, competing explanations, and confidence.

The initial development bands are 0-15 minimal, 16-39 mild, 40-69 moderate, 70-99 high, and 100-128 very high burden. For serial assessment, an ALI reduction of 20% or more was proposed as improving, change within plus or minus 10% as stable, an increase of 20% or more as deteriorating, and bidirectional changes greater than 10% as fluctuating. Recovery velocity can be expressed as change in ALI divided by elapsed time. These thresholds are development hypotheses, not validated cut-points, responsiveness criteria, or minimal clinically important differences. The most important innovation may be the separation of burden from confidence. A patient can be severely disabled while objective confirmation remains incomplete, another can have strong laboratory evidence with modest reported symptoms. Conflating burden and certainty can either dismiss disability or overstate causal knowledge. ALAS therefore asks two independent questions: How great and widespread is the burden? and How strongly does the available evidence support this interpretation? The profile-before-total rule is essential. A falling overall ALI can conceal dangerous deterioration in bladder or cardiovascular function. A high functional-compensation score can mean that

apparent stability is being purchased through extensive support. A lower score after activity withdrawal may not represent restored reserve. The profile keeps the person and the mechanism visible after calculation.

5.4. Recovery-Weighted Model: Interpreting the Meaning of Change

Companion operational worksheet: Cameo 4 of 6 - Recovery-Weighted Model Interpretation Worksheet. [Open Cameo 4](#) Identical symptom severity can represent different biological states. Severe orthostatic intolerance after an acute inflammatory illness may coexist with improving reflex function and preserved recovery potential. A less dramatic but persistent bladder deficit may indicate limited recovery. A falling symptom score may reflect restored regulation, more effective compensation, reduced activity, or avoidance of triggers.

The Recovery-Weighted Model separates four dimensions that conventional severity scoring can collapse [24].

Dimension	Question answered	Interpretive boundary
Symptom severity	How unwell and functionally limited is the person now?	Observable burden, does not determine mechanism, reversibility, or prognosis.
Recovery likelihood	How recoverable does the underlying process appear in light of mechanism and trajectory?	Revisable, biologically informed estimate, not an individual prediction.
Inferred autonomic injury	What might persistent dysfunction signify biologically?	Cautious interpretation, not proof of structural damage or a biomarker.
Clinical priority	What most requires assessment, monitoring, rehabilitation, protection, or investigation?	Integrates burden, risk, function, recoverability, and uncertainty, does not prescribe treatment automatically.

The conceptual expression "recovery-weighted burden equals current burden multiplied by a recovery weight" makes the logic explicit, but the mathematics remains deliberately unfinished. No empirical weights exist. Until prospective data establish calibration and interactions, recovery weighting must remain transparent clinical reasoning rather than a prognostic algorithm.

Four additional concepts give serial change a precise vocabulary. Trajectory is the pattern of change: continuous, stepwise, plateau, fluctuating, compensated stability, or progressive decline. Velocity is the rate of change. Vector combines direction, velocity, consistency, biological coherence, and confidence. Asynchrony recognises that cardiovascular, gastrointestinal, bladder,

thermoregulatory, cognitive, sleep, fatigue, and functional domains may occupy different recovery states at the same time.

5.5. RWCAM: Recording Longitudinal Recovery Consistently

Companion operational worksheet: Cameo 5 of 6 - RWCAM Longitudinal Review and Staging Record. Open Cameo 5

RWCAM operationalises this reasoning. At each review, it records burden, recovery trend, functional impact, objective evidence, confidence, patient priorities, new events, management plan, and next review interval. It also supplies a provisional stage language [25].

Stage	Recovery state	Meaning within RWCAM
0	Acute injury	Severe instability or loss of function, intensive assessment and short review interval.
1	Early recovery	Initial reduction in acute disturbance with major residual burden and uncertain direction.
2	Progressive recovery	Measurable improvement in regulation, tolerance, recovery time, or function across reviews.
3	Adaptive compensation	Function improves through support, pacing, treatment, or behavioural adaptation despite persistent physiological limitation.
4	Functional stability	Symptoms and adaptations are stable, independence is preserved with limited stress-related exacerbation.
5	Near recovery	Mild intermittent symptoms, near-normal activity, and minimal functional limitation.
6	Full clinical recovery	No clinically significant autonomic limitation within the assessed domain or overall profile.

The stages are not a one-way ladder and should never be assigned without a domain, vector, evidence, and confidence statement. A person may be at Stage 4 cardiovascularly, Stage 2 cognitively, and Stage 1 genitourinarily. "Full clinical recovery" also requires caution: it may not mean that vulnerability has disappeared or that reserve is normal under every challenge.

5.6. Candidate Recovery Flags: Translating Lived Change into Testable Signals

Companion operational worksheet: Cameo 6 of 6 - Clinical

Recovery Flags Observation Record. Open Cameo 6

The recovery-flags scholarship asks a practical question that is often left unanswered: "How will I know if I am getting better?" The present synthesis focuses on five candidate sentinel domains explicitly described in the integrated original work [26]. The cited article title refers to six clinical flags, whereas the integrated source text specifies five grouped sentinel domains. This paper retains the five domains actually specified, the discrepancy should be reconciled in the next source revision.

Candidate recovery flag	Why it may be informative	Required caution
Return of sweating and thermoregulation	May indicate renewed sympathetic cholinergic signalling and improved environmental adaptation.	Sweating varies with medication, endocrine status, climate, conditioning, and neuropathy distribution.
Improved exercise capacity and heart-rate responsiveness	Integrates chronotropic response, vascular tone, baroreflex behaviour, perfusion, conditioning, and post-exertional recovery.	Improvement may reflect training or treatment without full autonomic restoration, exertion must be assessed safely.
Improved cognitive clarity and endurance	May reflect more stable cerebral perfusion, lower physiological stress, improved sleep, or reduced inflammatory burden.	Cognition is multidetermined, improvement does not prove an autonomic mechanism.
Renewed motivation, anticipation, and emotional engagement	May reveal increased autonomic-limbic-endocrine capacity and energy for future-directed activity.	Psychological, social, endocrine, medication, and neurological explanations must remain open.
Return of sexual function and ideation	Requires coordinated parasympathetic, sympathetic, vascular, endocrine, sensory, and emotional function.	Highly personal and influenced by age, relationship, medication, endocrine disease, and culture, inquiry requires consent and sensitivity.

The contribution is not simply the list. It is the proposition that recovery may first become visible as renewed coordination across several systems before complete symptom resolution or formal test normalisation. The flags therefore belong inside a longitudinal record: date of return, persistence, context, objective correlates, alternative explanations, and relationship to later function. A single flag is weak evidence, a reproducible cluster with a coherent sequence is a stronger research signal, but still not proof of network repair.

6. How the Original Contributions Function as one System

The original contributions are not synonyms and should not be collapsed into one composite score. They form a sequence of hand-offs in which each layer answers a different question.

- BRR Theory explains the systems problem. It asks whether cumulative burden has progressively narrowed resilience and remaining autonomic reserve, and is operationalised in Cameo 1.
- MSAD defines the candidate phenotype. It asks whether multiple recognised secondary contributors and the multisystem presentation possess sufficient temporal and biological coherence to justify an integrative formulation, and is operationalised in Cameo 2.
- ALAS/ALI describes present burden. It records which domains are affected, how often, how severely, at what functional cost, and with what recovery time, while separating burden from evidentiary confidence, Cameo 3 provides the working instrument.
- The Recovery-Weighted Model interprets the meaning of change. It asks whether movement represents restoration, compensation, plateau, fluctuation, or decline, how fast it is occurring, and how confidently the biological and functional interpretation can be held. Cameo 4 makes that reasoning explicit.
- RWCAM records longitudinal change in a repeatable domain-specific language. It preserves stages, vectors, objective and functional evidence, asynchrony, support dependence, confidence, patient priorities, and review timing, Cameo 5 provides the serial review record.

- Clinical recovery flags make early network-level change observable. They provide candidate sentinel signals that can be dated, tracked, challenged, and correlated with later objective and functional outcomes, Cameo 6 supplies the prospective observation record.

The hand-offs are central to the framework's originality. BRR without MSAD remains a theory without a bounded phenotype. MSAD without ALAS risks naming a pattern without representing its burden. ALAS without recovery weighting can treat every point of burden as biologically equivalent. Recovery weighting without RWCAM remains an interpretive judgement without a repeatable serial record. RWCAM without prospective recovery-signal capture can describe later states while missing the point at which recovery first becomes visible. Recovery flags without the preceding longitudinal context remain anecdotes. The six-cameo architecture is designed so that each component addresses a limitation in the preceding one while retaining its own evidentiary boundary. The candidate recovery flags should not be confused with conventional medical red flags. The former are investigational signals of possible improvement. Urgent symptoms, severe haemodynamic instability, syncope with injury, evolving neurological signs, acute urinary obstruction, severe nutritional compromise, or other safety concerns require ordinary clinical assessment and are not replaced by this framework.

6.1. A Worked Conceptual Application to the Originating Clinical History

The author's history illustrates the sequence without validating it. The 2008 post-Chikungunya illness, the 2021 cardiac tamponade during ablation, and emergency sternotomy with cardiopulmonary bypass provide a chronology of recognised secondary insults. BRR Theory asks whether incomplete recovery and reduced reserve made the later collapse disproportionate. It does not claim that this causal pathway has been proved. The subsequent coexistence of orthostatic hypotension, supine hypertension, gastrointestinal dysmotility, urinary dysfunction, thermoregulatory change, fatigue, exercise intolerance, and cognitive symptoms provides the multisystem coherence that motivates the proposed MSAD phenotype. The phenotype does not replace the documented

cardiovascular, gastrointestinal, or urological diagnoses, it asks whether their cumulative pattern warrants one integrative secondary-autonomic formulation.

ALAS would then profile cardiovascular, gastrointestinal, genitourinary, thermoregulatory, neurocognitive, fatigue, sleep, and compensatory burden. No retrospective ALI is calculated in this paper because the required structured ratings were not collected prospectively under the proposed instrument. That restraint is important: a framework should not manufacture numerical precision from narrative data. Recovery weighting would interpret the later course domain by domain. Return of thermoregulation and improved heart-rate responsiveness may indicate a positive cardiovascular or sudomotor vector, while persistent bladder and gastrointestinal impairment may remain less recoverable or more clinically limiting. Increased function achieved through pacing, compression, dietary control, mobility support, or reduced exposure would be recorded as compensation rather than automatically labelled physiological restoration.

RWCAM would then place those domain-specific observations into a repeatable serial record: prior and current burden or stage, direction, objective and functional evidence, confidence, priority, asynchrony, support dependence, and the next testable review question. This prevents a single global stage from concealing discordant recovery across systems. The recovery flags would make the timing of sweating, exercise response, cognitive endurance, motivation, emotional engagement, and sexual function available for prospective correlation rather than retrospective impression. Their meaning would be strengthened by recurrence, convergence across domains, temporal coherence, objective correlates, and later functional improvement, it would be weakened by medication effects, endocrine change, conditioning, psychological or social explanations, or inconsistent observation. This worked sequence shows why the scholarship is more than a collection of related papers. It is an end-to-end autonomic model moving from history, to systems explanation, to phenotype, to burden profile, to meaning of change, to repeatable longitudinal recording, and finally to early recovery signals. Its value will depend on whether each hand-off can be operationalised reliably and whether the complete sequence adds information beyond existing autonomic assessment.

7. Why the Originality Matters to the Medical System

Originality matters here only if it responds to a consequential clinical failure. The principal failure is loss of the whole trajectory when care is divided by organ, test, and encounter.

7.1. Risk of Losing Cumulative Causation

When secondary contributors are recorded only as separate diagnoses, the chronology and interaction among them can disappear. One service may attribute deterioration to deconditioning, another to a post-viral syndrome, another to surgery, and another to medication or ageing. Any explanation may

be partly correct. The missed clinical object is the possibility that recognised contributors accumulated before resilience and reserve were restored. Naming that possibility as a testable formulation is more disciplined than either forcing one cause to explain everything or leaving the cumulative pattern uninterpreted.

7.2. Risk of Underestimating Burden

A brief consultation or a single symptom total may not reveal recovery time, support, planning, avoidance, or exhaustion required to maintain function. A person can appear stable because pacing, compression, fluid and salt strategies, environmental control, mobility support, altered meals, or reduced exposure carry much of the burden. Measuring symptoms without the cost of maintaining function can systematically understate disability and overstate recovery.

7.3. Risk of Overlooking Recovery

Clinical records often document pathology and deterioration more readily than restored regulation. If recovery is asynchronous, the first meaningful signal may occur outside the specialty conducting follow-up. Return of thermoregulation, improved chronotropic response, shorter post-exertional recovery, clearer cognition, or renewed engagement may be dismissed as anecdote unless serial observation provides a place to record and test it.

7.4. Risk of Confusing Symptom Relief with Network Repair

Treatment, support, reduced demand, and avoidance may reduce symptoms without increasing reserve. Conversely, biological improvement may precede major symptom reduction. Recovery-weighted reasoning requires both function and physiology to be followed, with clear acknowledgement of what is observed and what is inferred.

7.5. Opportunity for Coordinated Care and Research

A shared longitudinal record could improve communication among autonomic neurology, cardiology, gastroenterology, urology, rehabilitation, primary care, and allied health. It could also produce research-ready data: insult timelines, domain profiles, changes in compensation, recovery flags, vectors, objective measures, and patient priorities. The proposed framework thus connects clinical coordination with empirical testability.

The need for a serious medical-system response does not mean immediate adoption. It means that the gap should be recognised, the constructs independently examined, and the tools exposed to disciplined challenge rather than dismissed because they arose from lived experience. Patient-generated scholarship can identify a missing clinical object, scientific partnership must determine whether the proposed solution performs.

8. Research and Validation Programme

The combined architecture is sufficiently specified to support a staged programme. Validation should proceed component by component before the entire system is tested.

Phase	Core task	Principal questions
Concept and content	Delphi review and co-design with autonomic clinicians, rehabilitation disciplines, measurement scientists, and people with diverse secondary dysautonomias.	Are constructs complete, distinguishable, culturally appropriate, safe, and clinically relevant? Are the MSAD boundaries falsifiable?
Feasibility and item comprehension	Patient interviews, clinician think-aloud studies, completion time, acceptability, missing-data analysis, and testing of wording across aetiologies, cultures, and communication profiles.	Are frequency, severity, impact, recovery time, confidence, support, and trajectory items interpreted as intended?
Reliability	Test-retest assessment during stable periods, inter-rater assessment of confidence, stage, vector, and inferred injury.	Which components are reproducible? Which rely excessively on individual judgement?
Construct and structural validity	Comparison of ALAS/ALI domains with COMPASS-31, CASS, autonomic testing, fatigue, sleep, function, and quality of life, factor and item-response analysis.	Does the system correlate where expected while adding cumulative and longitudinal information? Are equal weights defensible?
Responsiveness and recovery flags	Serial assessment after treatment, rehabilitation, natural recovery, or new physiological insult, prospective recording of candidate flags before outcome ascertainment.	What change is real and meaningful? Do candidate flags precede independent functional or autonomic improvement?
Incremental and prognostic validity	Prospective multicentre cohorts with prespecified outcomes and blinded adjudication.	Do cumulative history, ALAS/ALI, stages, vectors, or flags add explanatory or predictive information beyond diagnosis, age, comorbidity, symptom severity, and standard testing?
External validation and implementation	Independent replication across aetiologies, ages, sexes, cultures, and healthcare systems.	Are performance, fairness, burden, safety, and clinical utility retained outside the development context?

Measurement development should follow accepted COSMIN principles for content validity, structural validity, reliability, measurement error, construct testing, responsiveness, and interpretability.^{17,18} Studies should prespecify standard autonomic measures, functional outcomes, objective correlates, competing explanations, and blinded outcome adjudication wherever feasible. Priority should be given to questions capable of disproving or materially revising the framework. Does a cumulative model add information after known diagnoses and comorbidity are accounted for? Do ALI dimensions duplicate one another? Can clinicians agree on MSAD confidence, recovery stage, inferred injury, and vector? Are the proposed change thresholds responsive and meaningful? Are recovery flags sufficiently reliable, temporally ordered, and specific to add value? A framework that cannot survive such tests should not enter clinical use.

9. Limitations, Safeguards, and Ethical Use

The integrated framework originates from conceptual synthesis and one unusually detailed illness trajectory. It may overrepresent the author's phenotype, language, and access to records. The boundaries among secondary autonomic dysfunction, deconditioning, medication effects, endocrine disorders, frailty, psychological distress, primary autonomic disease, and primary neurodegenerative autonomic disorders are often difficult to establish. A cumulative explanation can become unfalsifiable if every event is treated as confirming it. The 0-128 ALI creates an appearance of precision that exceeds present evidence. Domain weights, interpretive bands, percentage-change thresholds, recovery velocity, stages, and review intervals are provisional. A falling total may hide dangerous deterioration in one domain. Activity reduction or additional support can change reported burden without changing underlying physiology.

Language can also harm. "Autonomic injury" may be heard as confirmed structural damage, "recovery likelihood" may be heard as prognosis, "full clinical recovery" may overlook residual vulnerability, and "functional stability" may conceal substantial compensatory cost. Reports should state what is documented, what is experienced, what is inferred, what remains unknown, and what evidence would change the interpretation. The framework must therefore complement, not replace, medical history, examination, recognised diagnostic criteria, autonomic testing, haemodynamic assessment, differential diagnosis, relevant imaging and laboratory investigation, qualified judgement, and urgent red-flag assessment. In its present form it must not be used for self-diagnosis, treatment selection, disability adjudication, individual prognosis, or automatic service eligibility. The originality claim is also bounded. The literature considered for this synthesis did not identify an established framework that integrates all proposed components in this particular configuration. That observation is not equivalent to a completed systematic or scoping review. Priority, comprehensiveness, and incremental value should be tested through formal review and independent scholarship.

10. Conclusion: a Proposition that Warrants a Serious Response

This paper begins where the autonomic snapshot ends. It asks how the present state was formed, what adaptive capacity remains, how function is being sustained, and in what direction each autonomic domain is moving. The integrated contribution is specific. BRR Theory offers a systems explanation of cumulative secondary autonomic adaptation. MSAD names a proposed phenotype without replacing recognised contributors. ALAS/ALI makes multidomain burden, recovery time, function, confidence, and serial change visible. Recovery-weighted reasoning distinguishes restoration, compensation, plateau, fluctuation, and decline.

RWCAM provides a repeatable longitudinal language. Clinical recovery flags translate patient-observed change into testable candidate signals. Together, these elements form one autonomic reasoning architecture extending from cumulative history to interpretable recovery. The six linked companion cameos provide the corresponding operational layer: one worksheet for each conceptual component and one bounded hand-off to the next.

The work is original because it identifies and organises a clinical object that is repeatedly divided by existing systems: the person whose secondary autonomic burden accumulated across time and organs, whose apparent stability may depend on compensation, and whose recovery is real but asynchronous and incompletely measured. It is important because failing to represent that trajectory can lead to causal oversimplification, fragmented care, underestimation of burden, and failure to recognise recovery. Originality does not confer validity. The proper response is therefore neither uncritical adoption nor casual dismissal. It is serious scientific engagement: expert critique, co-design, formal literature review, psychometric development, prospective multisystem observation, independent replication, and revision or rejection of components that do not perform. The framework has advanced far enough to be tested. That is the point at which lived experience becomes a research programme.

Declarations

Consent for Publication: The author consents to publication.

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Central Hypothesis: “Reduced repair reserve under autonomic constraint” is proposed as a hypothesis-generating conceptual model and is not presented as an established diagnostic entity.

Ethics and Consent: This perspective is an autobiographical reflection written by the person whose experience is described. It reports no research participants, intervention, or systematically collected research dataset. The author consents to publication of the personal clinical material included here.

Data Availability: No research dataset was generated or analysed for this perspective. Clinical details are presented selectively and narratively, source medical records are not publicly available.

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ChatGPT (OpenAI) was used as an assistive communication and manuscript-preparation tool to support organisation, sentence construction, spelling, transcription, and conversion of the author’s notes, clinical observations, timelines, and narrative accounts into academic prose. This use was intended to mitigate substantial dyslexia-related writing and sequencing barriers and cognitive fatigue. The author supplied and reviewed the substantive content, clinical facts, interpretations, citations, arguments, and conclusions,

retained full editorial control, and accepts responsibility for the manuscript. The tool did not generate research data, determine findings, or qualify for authorship.

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