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Public Health and Advanced Nursing Interventions in ICU and Emergency Departments:ASystematicReviewofHealthSystemResilience,Quality,andPatient Safety

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BSTRACT
Background: Healthcare delivery systems across the globe undergo extreme adversity during public health emergencies, requiring ICU and Emergency Department infrastructure to be flexible and resilient. APN and specialized critical care nursing interventions can be used to support the integrity of system capacity, safety and quality during these adverse circumstances.
Objective:Toevaluatehowtheintegrationofadvancednursingandpublichealthin ICUsandEDsenhancesthe systemresilience, quality of care, and patient safetyin public health emergencies and crises of extreme resource limitations.
Methods A systematic literature search of Pub Med/MEDLINE and CINAHL, Embase and Scopus-indexed journals following Preferred Reporting Items for Systematic Reviews and Meta-Analyses(PRISMA) was conducted. We searched for studies on advanced practice nurses (APN), including nurse practitioners (NP), clinical nurse specialists (CNS) and/or nurse triage teams, crisis-capacity workflows, and integration of public health into expanded acute and critical care capacity during pandemic surges and other out-of-resource crisis situations from 2020-2025. Studies for the review were selected based on abstracts and quality was ascertained with a method utilized with the Joanna Briggs Institute (JBI) critical appraisal tools.
Results: Twenty studies synthesized four linked domains of outcome: (1) Workflow management and triage effectiveness (related to use of surge time to optimize flow); (2) Role flexibility and expanded scope of practice (related to increased critical-care capacity and workforce deployment); (3) Infection control and public health surveillance (related to nursing role in creating safer patient and community environments); and (4) Quality of careandpatientsafety(relatedtostandardizedassessment,missedcare,infection-controlpractices,coordination, and protocols). At each level, scope-of-practice limitations, staffing shortfalls, training needs, and lack of psychological supports were cited as barriers to scalability.
Summary: Based on limited observational evidence, advanced nursing contributions seem associated with improved health-system resilience and quality-of-care and patient-safety during PHEs, but the overall findings are heterogeneous. Formalizing advanced nursing roles with crisis training and quality improvement processes, together with patient-safety protections and adaptable workforce deployment, could strengthen ICU and ED preparations to face future PHEs.

Keywords: Crisis capacity, Gender, Infectious, Influenza, Intensive care, Management, Nurse patient ratio, Nursing, Patient safety.

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1. INTRODUCTION

1.1 BackgroundoftheStudy

Health systems are regularly affected by shocks such as pandemics, natural disasters, or mass casualties which lead to ina subset ofthe populationa demand for high-qualityacute and critical care that is compressed intime. Theseeventsareexpected to push simultaneouslyagainstavailablebeds, workforce,and infrastructure(Kleinet al., 2020). The COVID-19 pandemic is the most recent and extensively researched example as ICUs and EDs aroundtheworldwerechallengedtoincreasecapacityquickly,redeployandretrainstaffbeyondusuallevels,and provide IPC practices in the face of an overwhelming workload (Al Bazroun & Almahrouq, 2023; Clark et al., 2022).

APNs, which include nurse practitioners, clinical nurse specialists and nurses working within expanded or protocolisedscopesofpractice,haveakeystructuralpositionintheseresponses.Duetotheproximitytobedside care and the clinical scope of practice, APNs are often key to crisis-capacity actions, often leading nurse-driven triageinEDs,supervisingredeployedandnon-specialiststaffinICUs,andactingasfirstpointsofcontactforIPC and surveillance activity on individual wards (Jeyaraman et al, 2022; Al Mutair et al, 2020). A health system resiliencelens(thecapacityofahealthsystemtoabsorbacrisis,adaptitsoperatingsystemsandabsorbcontinued shocksto continueessentialservice delivery) helpsto understand howthesenursing-led responsesshapeand are shaped by the wider public health response (Motsepe & Schmollgruber, 2025).

Even though there is a wealth of pandemic-era literature concerning responses to the nursing workforce crisis, these sources remain siloed by discipline. Work in health services research has centeredon capacity-planningsources(Kleinetal.,2020),nursingscienceworkhascenteredontheworkforceexperienceandwellbeing (NikbakhtNasrabadietal.,2022),andhealthpolicyresearchhascenteredonscope-of-practiceregulation (Kleinpell et al., 2021; Myles et al., 2023). Literature on this topic has yet to be synthesized through a review.

"TheevidenceonadvancedpracticenursingandpublichealthintegrationinICUsandEDsasastrategyto improve health systemresilience in the face of public health emergencies and crises of severe resource scarcity"

Systematicreviewtoanswerthefollowingquestion:Whatistheevidenceofadvancedpracticenursingandpublic health integration in ICUs and EDs to improve health system resilience in the face of public health emergencies andcrisesofseverereresourcescarcity.Fourevidencestrands,includingorganizationalbarriers:workflowefficacy and triage, scope of practice and role flexibilities, infection prevention and public health surveillance.

Whatistheresearchgap:Moreover,thereviewexplores:Howdoadvancednursinginterventionandpublichealth approach influence quality of care and patient safety outcomes in crisis in ICU/ED? What organizational facilitators/ barriers influence these outcomes?

Firstitshouldbehighlightedthatresilienceofhealthsystemsinacutelyandcriticallyillpatientsisnotaseparate criterion of quality and patient safety. Rather, the capacity for resilience should be defined as the capacity to deliver timely, coordinated, evidence-based, and safe care to acutely and critically ill patients during the reorganization of care models or the increase of capacity in times of crisis. As such, quality of care and patient safety will be considered a family of closely linked outcome measures in which we can explore the effects of advanced nursing care.

2. METHODS

2.1 DesignandReporting

This review was performed and reported following the PRISMA (Preferred Reporting Items for Systematic ReviewsandMeta-Analyses)statement.Duetothewidescopeofthetopicandheterogeneityofstudiesofeligible designs(quantitative,qualitative,mixed-methods,andpolicy-analytic),anarrativesynthesisdesignapproachwas usedasopposedtometa-analysis,inlinewithotherreviewsonbroaddesignandoutcomemeasures(Clarketal., 2022; Motsepe & Schmollgruber, 2025).

2.2 SearchStrategyandInformationSources

Asystematicliteraturesearchfocusedonpeer-reviewedarticlesusingPubMed/MEDLINE-indexedsourcesand publication sources indexed by CINAHL, Embase, and Scopus, specifically, BMJ Open, e Clinical Medicine, Nursing Outlook,Frontiers inPublicHealth,andIntensiveandCriticalCareNursing,which alsoensureditems

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wereaddedtothefinalreviewfromthesamesource.ThesearchstrategyincludedCINAHL,Embase,andScopus, usingsearchesofthePubMedorMEDLINEsearchengines, withemailscreenalerts. Additionalhandsearching of the reference lists of this article and of grey literature, including health-policy briefs, and regulatory agency documents from 2020 to 2025.

Specific search terms employed included advanced nursing roles such as nurse practitioner, clinical nurse specialist, advanced practice nurse, nurse-led triage, and search terms describing health-care settings such as intensive care unit, ICU, emergency department, ED, and crisis contexts including COVID-19, pandemic, surge capacity, disaster, mass casualty, and scope of practice waiver.

As publicly available bibliographic search tools were used rather than direct affiliation with an organization or individual access to CINAHL, Embase, and Scopus, this review was a structured, rapid systematic review as opposed to a multi-database systematic review, although the latter will be presented as a future limitation in Section 5.

2.3 EligibilityCriteria

Inclusion criteria for studies were as follows: (a) published in English 2020-2025; (b) investigated an expanded/advancednursingrole(e.g.,nursepractitioners,nursespecialists,advanced-practiceorprotocoldriven, nurse-led teams) and included an ICU, ED or other critical/acute care setting; (c) addressed at least one of three areasofinterest-triage/workflow,scope-of-practice/roleflexibility,orinfectioncontrol/publichealthsurveillance-withinthecontextofapublic healthemergency, pandemicsurge,orsimilarconstrainedresourcesetting;and(d) included empirical data, a registered protocol with baseline data, or systematic synthesis of primary studies. Exclusion criteria included studies that addressed only pediatric populations, primary care/ambulatory care outside of an acute crisis, or other clinical services that did not include a nursing-specific focus.

For the new title and synthesis, evidence was also coded to quality-of-care and patient-safetyoutcomes, if these werereportedorexplicitlydiscussedintermsofthestudyincluded.Nonewstudiesoroutcome data wereadded outside ofthose identified in the original evidence set of20 studies; the qualityand safety synthesis islimited to this original evidence set.

2.4 StudySelectionandDataExtraction

Records were initiallly screened at title/abstract level and then full text level for eligibility to inclusion based on the eligibility criteria described above. Data were extracted into a pre-designed data extraction sheet including author(s)andyear,country,design,setting,sample,contextofthecrisis,intervention/exposureofinterest(nursing intervention or exposure in relation to the crisis), outcomes of interest (resilience related outcomes; quality-of-care outcomes; patient-safety outcomes; important themes), and thematic domain(s) addressed Table 1). 20 studies met the full eligibility criteria and are included in the synthesis below.

2.5 QualityAppraisal

ThestudyselectioninincludedstudieswasappraisedfollowingtheapproachdevelopedinJoannaBriggsInstitute (JBI) critical appraisal tools suite as follows: different checklists were applied according to study designs: systematicreviews;analyticalcross-sectionalstudies;qualitativestudies;andtext/expertopinion.Duetothefact that some of the studies included in this review were rapid reviews and protocols or policy reports rather than primary trial study reports, quality assessment focused on transparency of methodology, clarity of research question and rationale and alignment of outcome measures with objectives, rather than an aggregate numerical score. Studies were rated on high, moderate, or low/limited confidence (Figure 4); no study was excluded based on quality alone (these studies are reported narratively) because of the exploratory, crisis research context.

3. RESULTS

3.1 StudySelection

The search and screening procedures are illustrated in Figure 1. Database-indexed searches yielded 156 articles andwerecomplementedby12articlesidentifiedthroughmanualsearchesandgreyliterature,amountingtoatotal of168articles.Afterremoving41duplicates,127articleswerescreenedonthebasisoftitleandabstract,ofwhich 74 articles were excluded as not pertinent to the population, setting, and topical focus of the review.

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Forty-six full-text articles were assessed for eligibility, of which 33 were excluded due to a lack of focus on advanced-practice and crisis-capacitypositions (n= 14), presentationas protocols with no outcome data (n= 6), as pediatric or non-acute settings (n = 7), as overlapping samples or duplicate cohorts (n = 4), or a paucity of methodological information to evaluate articles' quality (n = 2). Twenty articles were included in the final qualitative synthesis.

3.2 CharacteristicsofIncludedStudies

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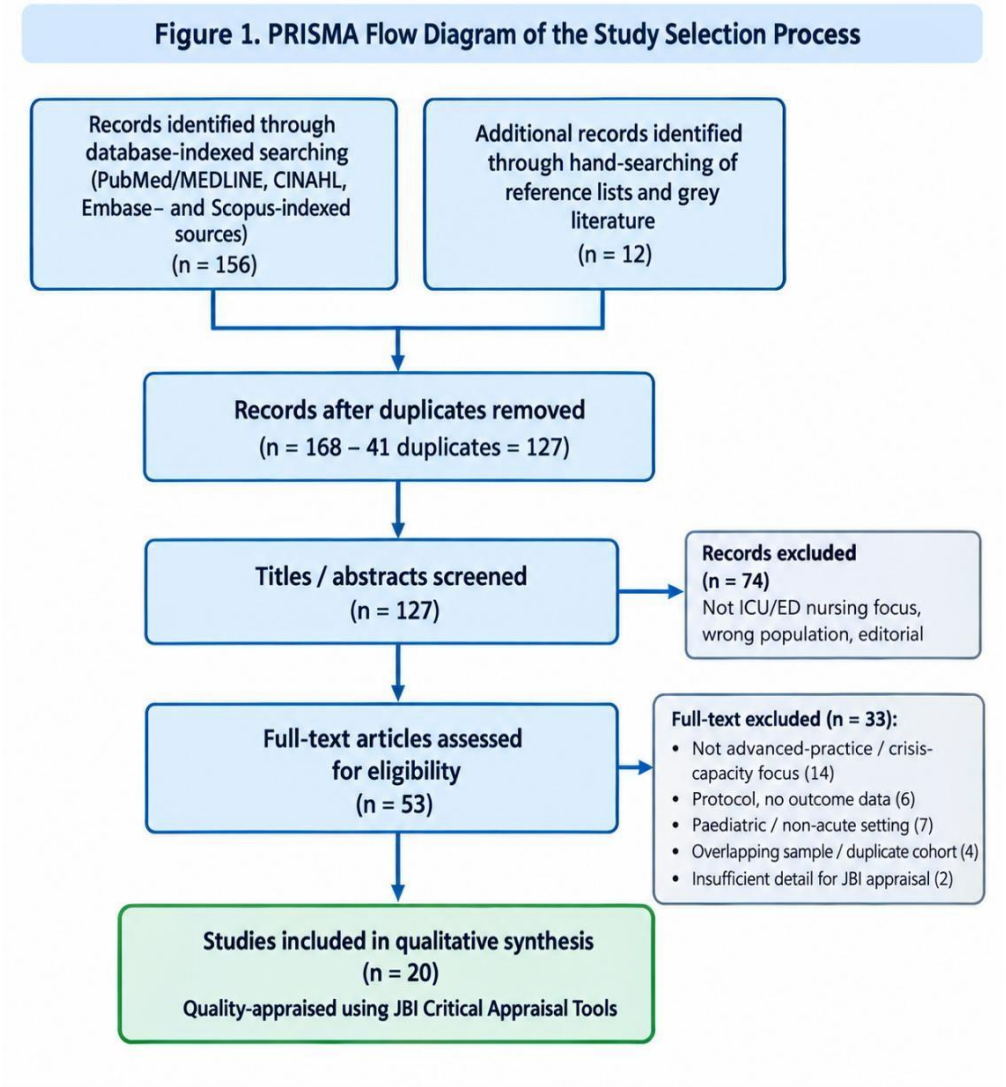

Figure1.PRISMAflowdiagramofthestudyidentificationandselectionprocess.

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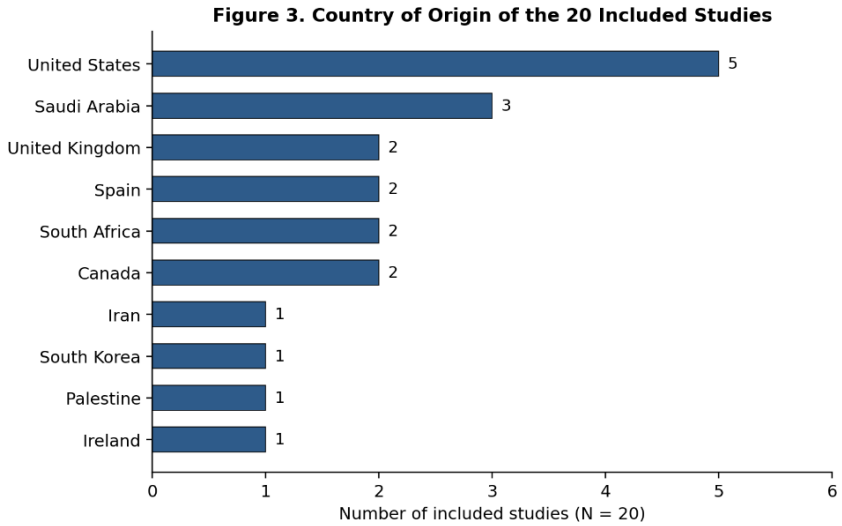

Figure2.Countryoforiginofthe20includedstudies.

Table1.DataExtractionSummaryofthe20IncludedStudies

The table below summarizes author/year, country, study design, setting/sample, key findings, and thematic domainforeachofthe20studiesincludedinthequalitativesynthesis,orderedastheywereextractedduringfull-text review.

Author (Year)	**Country**	**StudyDesign**	**Setting / Sample**	**KeyFindings**	**Theme**
AlBazroun& Almahrouq (2023)	SaudiArabia	Retrospectivequalitative institutional review	Single ICU; expanded 20→50 beds	Preceptor-ledstaff categorization &training model enabled150%ICU bed expansion whilemaintaining supervisionstructure	Theme 2
AlMutairet al. (2020)	SaudiArabia/ Australia	Expert-panel literature review & guideline	5-memberexpert panel; multi-database review	Proposed team-based nursing surge-staffingmodel (INS) for ICU pandemic surge response	Theme 2
Jeyaramanet al. (2022)	Canada	Systematicreview& meta-analysis	Primary healthcare professionals incl.NPsinED triage	Employing NPs/nurses with increasedauthority attriageassociated withreducedtime-to-provider and improved flow metrics	Theme 1
Al-Shareefet al. (2022)	SaudiArabia	Narrative review of institutional experience	Singleacademic ED,COVID-19 period	Fast-trackstreaming & expanded nurse-initiated protocols reduced	Theme 1

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Author (Year)	Country	StudyDesign	Setting / Sample	KeyFindings	Theme
				overcrowdingand boarding	
Gibbonsetal. (2023)	UnitedStates	Retrospective ecological/observational study	U.S.states&regions, COVID-19 period	Higher ICU utilization/capacity strain associated with increased weekly COVID-19 mortality	Theme 2
Nikbakht Nasrabadi et al. (2022)	Iran (multinational synthesis)	Systematicreview& meta-synthesis (qualitative)	17qualitative+ 2 mixed-methodsstudies of ICU nurses	Identifiedprofound emotional/physical strain alongside professional-growth themes amongCOVID-19 ICU nurses	Theme 2
Kleinpelletal. (2021)	UnitedStates	Nationalcross-sectional survey	16,699APRNs across50states	Practice-waiver benefit unevenly distributed;greatest positiveeffectin rural/shortageareas	Theme 2
Mylesetal. (2023)	Canada (Ontario)	Health-policy reform analysis	Provincial emergency scope-of-practiceorder	Emergency order expanded scope withoutaparallel competency-evaluation framework	Theme 2
Kim&Kang (2022)	SouthKorea	Qualitativestudy	9nurses,long-term care hospitaloutbreak	Identified under-resourced IPC response: isolation shortfalls, no dedicated IPC specialists	Theme 3
Gerhartetal. (2025)	UnitedStates	Secondarylongitudinal (cross-lagged) analysis	ICU interprofessional teams; communication intervention	Improved nurse–physician collaboration predicted subsequentdecrease in depersonalization	Theme 2
Klein et al. (2020)	UnitedStates	Systematicreviewof capacity-planning models	6 COVID-19 hospital surge-capacitymodels	Nurse-sensitive staffing/LOS parameters inconsistently represented in system-levelsurge models	Theme 1

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Author (Year)	Country	StudyDesign	Setting / Sample	KeyFindings	Theme
Motsepe & Schmollgruber (2025)	SouthAfrica	Focused mapping review & synthesis	15studiesonemergency-nurse disaster competencies	Communication, incident management, safety/security,and planning are dominantdisaster-nursing competencies	Theme 3
Quesada-Puga et al. (2024)	Spain	Systematicreview& meta-analysis	18 quantitativestudies of ICUnurses	~50% pooled burnoutprevalence; inverse association between burnout and jobsatisfaction	Theme 2
Banganietal. (2023)	SouthAfrica	Mixed-methods cross-sectional study	116 ICUnurses,Groote SchuurHospital	Moderate IPC knowledge (78%) but low attitude scores(55%);only 47%N95-fit-tested	Theme 3
Bawaqneh et al. (2025)	Palestine (Northwest Bank)	Quantitative cross-sectional study	115ICUnurses	Moderate-to-low IPC knowledge; specificperceived practice barriers identified	Theme 3
Font-Cabrera et al. (2023)	Spain	Mixed longitudinal study protocol (registered)	Retrospective n=1,095; prospective n=547, ED	Advanced nurse triageprotocoltobe evaluated against quality-of-care and wait-timeoutcomes	Theme 1
Kirwanetal. (2025)	Ireland	Cross-sectionalsurvey	113 nurses, acute general hospitals	Handhygiene& HAI-minimization most frequently missed IPC activities under pandemicworkload	Theme 3
Clark et al. (2022)	United Kingdom	Systematicreview	15 papers, 6countries, ICUde-escalation	Wellbeing/training de-escalation strategies rarely formallyevaluated for effectiveness	Theme 2
VeraSanJuan et al. (2022)	United Kingdom	Systematicreview	Redeployment& training literature, first pandemic year	Wide range of reconfiguration strategies used; robustcomparative evaluation still limited	Theme 2
O'Reilly-Jacob & Perloff (2021)	United States (Massachusetts)	Mixed-methods web-based survey	391 nurse practitioners	75% saw no meaningful change from waiver; PMHNPs	Theme 2

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Author (Year)	Country	StudyDesign	Setting / Sample	KeyFindings	Theme
				significantly more likely to report benefit	

IPC=infectionpreventionandcontrol;NP=nursepractitioner;APRN=advancedpracticeregisterednurse;ED =emergencydepartment;ICU=intensivecareunit;HAI=healthcare-associatedinfection;LOS=lengthofstay; PMHNP = psychiatric mental health nurse practitioner.

3.3 QualityAppraisalSummary

Preliminary quality appraisal, using JBI critical appraisal domains, suggests that of the 20 studies included, 8 studieswereclassifiedashighconfidence,inthattheydescribedtheirmethodologyexplicitly,sampleandresults were described sufficiently, and their outcomes addressed their stated aims. 10 studies fell into moderate confidence,byvirtueofbeinggenerallysound,butoflimitedgeneralizabilityorapplicabilityduetotheirsingle-site nature, small response rates, or narrow population ranges. 2 studies received low or limited confidence by virtue of their APIC survey reporting at the protocol stage, or policy-analytic studies which included a public healthpolicycomponent,buthadnocomparatorgroup.There wasnoapparentpatternoflowerstudyqualityby thematic area. In survey studies concerning scope-of-practice waivers, results relied on perception data, rather than outward tracking and evaluation of objective health and safety outcomes, discussed further in Section 5.

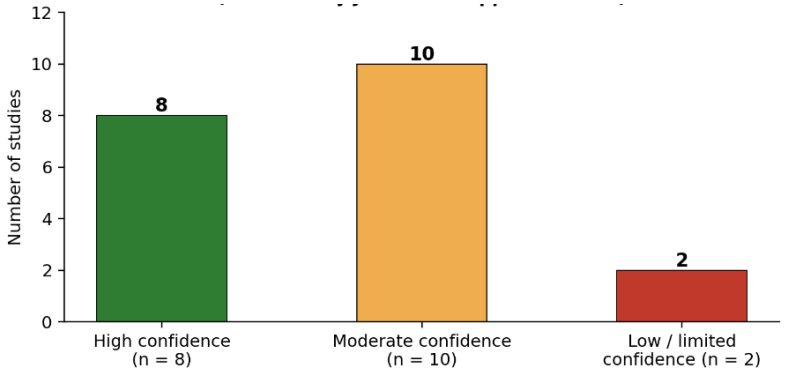

Figure3.Rapidmethodologicalconfidenceratingofthe20includedstudies.

3.4 ThematicSynthesis

Three interrelated thematic domains emerged from the synthesis, summarized quantitatively in Figure 2 and narratively below: Workflow Optimization and Triage Efficiency (4 studies), Role Flexibility and Advanced Scope of Practice (11 studies), and Infection Control and Public Health Surveillance (5 studies).

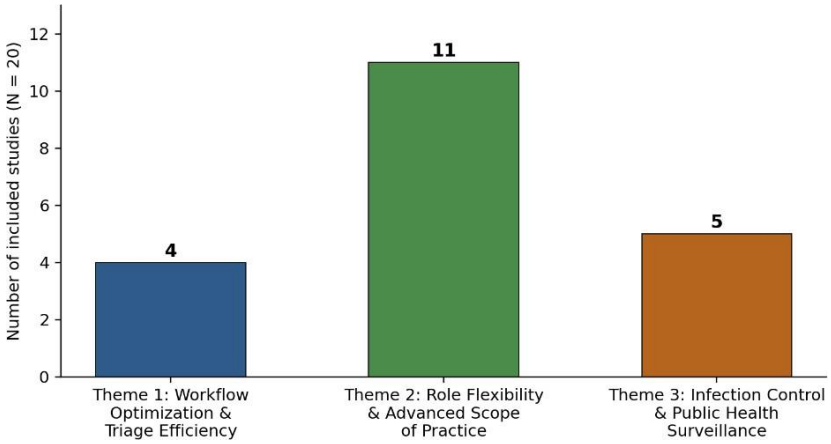

Figure4.Distributionofthe20includedstudiesacrossthethreethematicdomains.

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Theme1:WorkflowOptimizationandTriageEfficiency

Similarly, model nurse- and advanced-practice-led triage consistently shows benefits to flow. Jeyaraman et al. (2022), a systematic review and meta-analysis of primary healthcare nurses (including nurse practitioners) and nurses with additional authority working at ED triage, documented that using nurses or advanced-practice clinicians at or near triage could result in reductions in various flow measures, including time to initial provider assessment,inthecombineddatafromthe sourcestudies.However,theabilitytoquantifyeffects was hampered by the many differences between the study settings and methods.

Complementary evidence emerged from a single-site Saudi Arabian study that described implementation of a bundleofEDflow-improvementstrategies,includingadedicatedfast-trackstreamandincremental,team-based, nurse-initiated care protocols, implemented in response to COVID-19 to alleviate crowding and boarding (Al-Shareef et al., 2022).

High-complexitySpanish-designatedhospitalsfurtheroperationalized"advancedtriage"inaresearchprotocolin whichnursesmanagelow-tomoderate-acuitypresentationsinthecontextofmultidisciplinarystandards,andplan aretrospectivebaselinecohortof1,095patientsand aprospectivecomparisoncohortof547patientsto compare quality-of-care and waiting-time measures (Font-Cabrera et al., 2023). The earlier Klein et al. (2020) modeling reviewof COVID-19 hospital-surge-capacity-planningtools showed bed reallocation,staff-to-patientratios,and length-of-stay assumptions as central, but less often recognizable, inputs into system-wide surge models, while underscoring the practical importance of capacity planning data at the operational level.

Theme2:ExpansionofScopeofPracticeandRoleFlexibility

The largest cluster of evidence centres on the permissible flexible expansion of scope of practice for nurses in timesofcrisis.OntheinstitutionallevelloneSaudiArabian hospitalwasabletoexpandcapacityofitsICUfrom 20 to 50 beds in the COVID-19 surge, by stratification of nurses on the basis of critical-care experience, and implementationofapreceptormodelfornon-ICUnursestemporarilyredeployedtocriticalcare(AlBazrounand Almahrouq,2023).Thisstrategywasreflectedintheexpert-panelguidancetodeployateam-basedmodelofICU nursingworkforceinasurgesetting(AlMutairetal.,2020).Whilemanytrainingandworkforce-reconfiguration strategies were employed nationally and internationally during the first year of the pandemic, comparative evaluation of those strategies is very limited (Vera San Juan et al., 2022), let alone strategies to de-escalate redeployed staff back to baseline (Clark et al., 2022).

At the policy level, the COVID-19 pandemic triggered a widespread, largely short-term, pause in scope-of-practicerestrictionsonnursepractitionersand other advanced practicenurses(APN) for thefirsttimeintheUS. AUSnationalsurveyof16,699advancedpracticeregisterednurses(APRN)documentedthatthepractice-waiver effect was uneven. According to the survey, many more AP RN in rural jurisdictions, private outpatient clinics, and health-provider shortage areas reported a positive practice-wavier effect (Kleinpell et al., 2021).

By contrast, a similar single-state Massachusetts nurse-practitioner survey showed that 75 percent of the NP respondents did not believe that suspending physician-supervision conditions for a year significantly enhanced the practice.

However, the three-quarters of psychiatric-mental-health NP respondents were more likely to say that there was a positive effect (O'Reilly-Jacob & Perloff, 2021). Findings from Ontario's emergency scope-of-practice order also cautioned that the order increased providers' capacity but was without a formal evaluation plan, raising uncertainty whether the lessened regulation ensured competence with less oversight (Myles et al., 2023). Thus, evidence for flexibilityinregulationalone does not necessarilymeanthe time isright to fullyunleashadvanced-roles' capacities.

Information regarding clinician well-being reinforced the strengths of a well-designed role for system sustainability.AqualitativemeteSynthesisoftheexperienceofICUnursescaringforpatientswithCOVID-19-whichused17qualitativeand2mixed-methodsstudies-describedtheemotionalandphysicaltollofthepandemic coupled with a number of themes related to professional growth arising from the increase in their responsibility (NikbakhtNasrabadietal.,2022).Asystematicreviewandmeta-analysisof18quantitativearticlesshowedabout 50%pooledprevalence ofburnoutinICUnursesthat mayhaveincreased duringtheCOVID-19 pandemic, with burnout being negatively associated with job satisfaction (Quesada-Puga et al., 2024).

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Interestingly,asecondaryanalysisofdatafromaninterprofessionalnurse-physiciancommunicationintervention showed that an improvement in quality of interprofessional nurse-physician collaboration in the ICU foreshadowed a subsequent decrease in the level of depersonalization, an essential element of burnout, in the interprofessional team.

Thesefindingsimplythatstructural,team-levelinterventionsmaybeanimportantandunderutilizedintermediary target (Gerhart et al., 2025). Using state-level ICU utilization and capacity strain in Gibbons et al.'s ecological work (2023) showed an association with worse COVID-19 mortality - highlighting the population-level implications of using service-level capacity to preserve surge capacity.

Theme3:InfectionsManagementandPublicHealthSurveillance

Nursing-led infection control and prevention practices have also appeared as a discrete though relatively under-resourced resilience response. A quantitative-qualitative study of 116 IC nurses at a South African academic hospital found only moderately good COVID-19 infection-prevention and control (IPC) knowledge (78%), with lowattitudescores(55%)andbarelyadequateIPCtrainingtime,givenlowPPEstocklevelsandnorecertification training for N95 respirators, of which 47% had been fit-tested (Bangani et al., 2023). A similar cross-sectional study of 126 IC nurses in the Northwest Bank found generally moderate-to-low knowledge levels of infection-control measures, and listed perceived barriers to implementation (Bawaqneh et al., 2025).

And in Ireland, a cross-sectional survey of 113 nurses using the Missed Nursing Care Infection Prevention and Controlinstrument revealed amongother activities thathand hygieneand hospital-acquired infectionprevention activities were the IPC task most often omitted in the face of pandemic work pressures (Kirwan et al., 2025).

A qualitative paper from a South Korean long-term care hospital outbreak pointed to under-resourced infection control activities, including inadequate isolation capacity, no dedicated infection-control staff, and no ongoing national monitoring, as areas in need of structural, as well as provider, changes (Kim & Kang, 2022).

At the disaster-preparedness interface a targeted mapping review of disaster-competency literature regarding emergencynursesrevealed thedisciplinesofcommunication,incident-managementsystems, safety/securityand preparedness/planningtobethemostreliablyrecordeddomainsofanurse-leddisasterresponsecapacity(Motsepe &Schmollgruber,2025).Thisreview,whichwasbasedupon15papersfollowingscreening,(ibid.),suggeststhat themostrelevantskillsofinfection-controlanddisaster-surveillanceareunevenlydistributedandoftensubverted bystructural,notsolelyindividual,under-resourcingofRNknowledge.Thishasdirectrelevancetotheintegration of public health into the acute-care arena.

3.5 QualityofCareandPatientSafety

However,qualityandpatientsafetyappeartobecriticalintermediateoutcomesthatbindoperationstoworkforce decisions.Theevidence fromthisreviewsuggeststhatadvanced triageand protocolled workflows mayimprove quality, by means of their effects on timeliness, patient flow and structured assessment; expanded roles and redeploymentrequirecompetencybasedtrainingtosupportsafecareduringcapacityexpansion;andtheinfection-controlliteraturewouldsuggestthatpatientsafetyisatriskwhereavailablecapacityintermsofPPE,trainingand isolation space and dedicated infection-prevention resources is limited.

The findings also highlight the importance of preventing missed care and reliable safety processes during surge periods. For example, the Irish missed care survey found that hand hygiene, and work to prevent healthcare-associatedinfections,areactivitiesthatareatriskofbeingmissedduringincreasedworkloadpressurescausedby the pandemic (Kirwan et al., 2025). Similarly, ICU infection-control preparedness studies have reported unmet knowledge,fit-testing,resourcesandperceivedbarrierstopractice(Banganietal.,2023;Bawaqnehetal.,2025).

Theseexperiencessupportaqualityandsafetyviewofresiliencethatoperationalizesresilienceasdependent not on increased capacity alone, but on protection of timely, coordinated and safe care.

3.6 OrganizationalBarrierstoScalability

Across all three themes, three common barriers emerged that hampered the expansion and sustainability of all threetypesofnursing-ledresilienceinterventions.Scopeofpracticerestrictions,evenwhentemporarilyremoved or temporarily waived, was noted as an insufficient mitigation because all organizations faced challenges stemmingfromcredentialing,payerpolicies,andinstitutionalculturethatcontinuedtoprecludefullscopeof

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practiceafterscopeofpracticewaivers(Kleinpelletal.,2021;O'Reilly-Jacob&Perloff,2021;Mylesetal.,2023).
Second,chronicandacutestaffingshortages meantthatredeploymentstrategiesandexpanded-scopeapproaches utilized resources already short-staffed.
There was little formal assessment of whether compressed and focused training programs for re-deployed non-specialist nursesto care for critically ill patients was enough (Al Bazroun& Almahrouq, 2023;VeraSanJuanet al., 2022).
Third,psychologicaland occupationalsupportfor nursesfillingexpanded rolesand incertaincrisis-settings was inadequate. Staff burnout was endemic, yet in the view of others, was potentially modifiable through structural changes to interprofessional teamfunctioning rather than focus on individual-level wellness interventions (Gerhart et al., 2025).

4. DISCUSSION

This scoping review integrated 20 studies spanning 2020-2025 on advanced nursing practice and public health integrationinICUandEDsthatimprovedcrisisresponseandhealthsystemresilience.Despitelimitedconsistency acrossthe three macro-level yet interconnected qualitative domains, findingsdemonstrate that advanced nursing practice was positively associated with health system resilience, with nurse-led triage and protocolized work processesalso supportingoptimizedpatient flow(Jeyaramanetal.,2022;Al-Shareefetal.,2022).Greaterscope and adaptabilityofnurses'rolesappeared tobolster bothexpanded capacityand workforce wellbeing,especially when coupled with support for collaboration across the professional team (Al Bazroun & Almahrouq, 2023; Gerhart et al., 2025). Nurse-led infection prevention and disaster preparedness activities, although often less so, represented an important element of bedside public health capacity (Bangani et al., 2023; Motsepe & Schmollgruber, 2025).
Anotherthemeacrossmultiplereferencesisthatofagapbetweenthecontentofpolicyandtheoperationalreality. As was discussed above, many of the rapid state regulatory scope-of-practice waivers granted during the initial COVID-19 outbreak were viewed by nurse practitioners and APNs in several articles as inadequate to support practice changes at the bedside, due to systemic credentialing and payer restrictions not simultaneously being relaxesattheorganizationallevel(O'Reilly-Jacob&Perloff, 2021;Kleinpelletal.,2021).Inviewofthis,policy makerspreparingforfuturepublichealthemergenciesshouldbepreparedformultiple,layeredrestrictionstoexist at once and not expect regulatory waivers alone to free up the full scope of practice.
The wellbeing evidence we've identified in this review also has relevance for scope of practice. Rather than conceptualizing clinician burnout as a psychological phenomenon solely resulting from individual-level interactionswithpeersorsystems,thelongitudinalevidencefromGerhartetal.(2025)pointstodepersonalization as a downstreamconsequence of structural alterations to nurse-physician collaboration. This finding aligns with other propositions in the critical-care literature to conceptualize clinician wellbeing as an emergent property of team and system design and has immediate implications for how crisis-era redeployment and expanded-scope models are conceptualized, designed and implemented.

4.3QualityofCareandPatientSafety

The new synthesis reflects the clear consensus that quality and safety are integral rather than by-products of managingsurge capacity. Systems ofadvanced triage, nurse-initiated protocolsand formal clinicalroutines may contribute to better timeliness and continuityof care. Redeployment and a broader scope of practice may secure high-priority services when implemented with competency-based orientation and supervision. Conversely, the evidence about infection-control and missed-care highlights how pre-existing safety processes can become vulnerable to the pressure of a surge in demand unless they are safeguarded by appropriate levels of staffing, equipment and organizational surveillance.
Forpatient-safetyquality,theevidencesupportsasystemsapproach.Inacrisis,safetyreliesonacomplexmulti-layernetworkofinfluences:havingtherightscopeofpractice;havingtherightstaffinglevels,skillmixandtools; using robust infection-prevention processes; functioning communication channels among disciplines and specialties; and the presence of an equitable system for deflecting and catching potentially-missed care. The existingliteraturedoesnotallowcalculationofapooledestimateofadverse-eventreductionoreffectsizeon

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patient safety. Thus, this review estimates the quality and safety literature non-metaphorically, and restricts evaluation of causality to the context of each separate study.

5. LIMITATIONS

DatabaseAccess:Thisreviewwasperformedusingfreelyavailablebibliographicsearchresourcesasopposedto institutionalaccesstoCINAHL,Embase,orScopus.Whilethearticlesreturnedmaycloselyoverlapwithcontent contained within these databases (by referencing publications indexed within Pub Med/MEDLINE and journals (CINAHL/Embase/ScopusjournalslikeBMJOpen,eClinicalMedicine,andIntensiveandCriticalCareNursing) for example), the search cannot be comprehensive, and it is probable that some eligible articles may have been missed. This would be more possible using direct multi-database institutional access.

The studies incorporated varied designs-systematic reviews, meta-analyses, one single-site retrospective review, cross-sectionalsurvey,aswellastheregisteredprotocolwithbaselinedataalone.Duetothisheterogeneity,meta-analyses were conducted. However, a narrative synthesis was employed as meta-analyses has a greater potential for bias of interpretation than pooled quantitative synthesis.

Self-reportBias:Manyofthestudiesrelatedtoscope-of-practiceandburnoutdependedonself-reportperception ratherthanperformanceoroutcomemeasures(i.e.Kleinpelletal.,2021;O'Reilly-Jacob&Perloff,2021;Bangani et al., 2023). These types of measures don't capture how the intervention really had an impact, and the results should be taken with a grain of salt.

Geographic/Setting ConcentrationEvidence from10 countries, with most evidence in the US, Saudi Arabia and few other upper-middle and high income health systems. Uncertainty exists as to the utility of the evidence in low-resource/fragile health systems, where the strain on crisis-capacity may be very different.

TemporalFocus:MostofthestudiesincludedinthisreviewwereperformedduringtheCOVID-19pandemic,or as part of an emergency response to it. It is uncertain to what degree these results may be applicable to crises of other types (e.g., natural disasters, mass casualty incidents, other nonrespiratory pathogen outbreaks).

Implicationsforpracticeand policy:Thissynthesisoffersfourimplications forhealthsystemandpolicyleaders. First,thatexpandingscopeofpracticetoincreasecrisis-responsecapacitywillbemosteffectivewhencombined with organizational, credentialing, and payer reforms. Second, redeployment and skills-mix reforms should be supportedbytransparent,competency-andskills-basedtrainingandcompetencyvalidationalongwithestablished and supported pathways for de-escalation and psychological support.

Third, nurse-led infection-prevention and control activities should be regarded as structural patient-safety and public-healthinvestmentswithprotectedtimefortrainingandcompetencyvalidation,appropriatePPE,fittesting, and specialized support.

And finally, resilience planning for ICU and ED capacity expansion should be supported by transparent metrics of quality and patient safety that include measures of timeliness, care and communication breakdown, infection prevention, and continuityof care so that capacityexpansion does not come at the expense ofqualityand safety.

CONCLUSION:

This systematic review of 20 articles in the existing literature (published 2020-2025) offers heterogeneous but convergent evidence that advanced nursing activities-namely nurse-led triage, expanded scope of practice, evidence-based redeployment, and nurse-led infection prevention and disaster-preparedness-helped to sustain ICU/ED resilience during a public health crisis. The revised synthesis illuminates that the quality and safety of careisimplicittoresilienceandpreservingtimelyassessment,nursingworkprocesses,infection-controlpractices, competency, and safety-critical processes is vital to maintainingpatient care amid disruption. Evidence does not support a pooled causal estimate of improvement in quality and/or patient safety (as most studies were observational and descriptive). Advanced crisis nursing models should co-ordinate with quality-improvement measurement, patient-safety-netting, competency-based training, and deployable critical-capability workforce deployment.

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