A Checklist-Based Framework for Assessing the Functional Conversion Potential of Existing Buildings for Healthcare Uses

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Abstract. The COVID-19 pandemic exposed structural and organizational vulnerabilities in healthcare systems, highlighting the urgent need to strengthen community-based care provision. In Italy, Mission 6 of the National Recovery and Resilience Plan (NRRP) promotes the development of Community Health Facilities (CHFs), where the adaptive reuse of existing buildings represents a strategic yet technically complex solution. However, such interventions are often undertaken in the absence of integrated and operational evaluation frameworks specifically tailored to this context. This study proposes a checklist-based decision-support framework for the ex-ante assessment of the suitability of existing buildings for conversion into low-complexity healthcare facilities. The model is developed through the systematic integration of scientific literature, regulatory requirements, and technical standards, ensuring both methodological consistency and practical applicability. It is structured as a hierarchical multicriteria system focused on the intrinsic building characteristics, encompassing key dimensions including building flexibility, state of conservation and maintenance, environmental safety, accessibility, fire safety compliance, and energy performance. Each criterion is operationalized through discrete scoring scales grounded in applicable technical standards and regulatory references, enabling standardized, transparent, and comparable evaluations. The proposed framework supports the identification of critical constraints and enhances the consistency, replicability, and robustness of public decision-making processes in the context of healthcare infrastructure planning.

Keywords: Community Health Facilities (CHFs) · Decision-support systems (DSS) · Checklist-based assessment · Ex-ante evaluation · Building performance · Public decision-making

1 Introduction

The COVID-19 pandemic exposed significant structural, organizational, and managerial vulnerabilities in healthcare systems worldwide [1]. In many contexts, emergency responses were constrained by infrastructural limitations, technological gaps, and a limited capacity to rapidly adapt healthcare facilities and organizational models [2]. In Italy,

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O. Gervasi et al. (Eds.): ICCSA 2026 Workshops, LNCS 16765, pp. 310–328, 2027.
https://doi.org/10.1007/978-3-032-30536-7_20

the pandemic represented a major stress test for the National Health Service (NHS), highlighting longstanding structural weaknesses—particularly the condition of the healthcare building stock, often characterized by obsolescence, spatial rigidity, and limited functional adaptability [3–5]—while making explicit a structural imbalance between hospital-based and community-based care, which led to the progressive overloading of hospital facilities and a significant reduction in continuity of care for chronically ill and vulnerable patients [6]. Strengthening community-based healthcare has therefore emerged as a key priority for enhancing system resilience, understood as the ability to respond to shocks while ensuring continuity of care [7–9].

This imbalance reflects a long-term structural evolution of the NHS: since the 1990s, reforms aimed at improving financial sustainability progressively favored hospital-based services, while community-based care historically lacked equally structured evaluation and financing systems [10]. The pandemic made these weaknesses fully explicit, as hospitals became the primary access point for care, leading to overloaded emergency services and delays in routine and chronic care pathways [11–13]. In response, strengthening proximity-based healthcare has become a central objective in European and national policy agendas, and the Italian NRRP, supported by Next Generation EU, identifies Mission 6 (Health) as the vehicle through which to pursue this goal, with Component 1 focused on the reorganization of community healthcare networks [14, 15].

Among the newly introduced facilities, Community Health Facilities (CHFs) represent the central node of the community healthcare network and constitute the unit of analysis of this study. Due to their limited functional complexity and modest scale, these facilities are particularly suitable for adaptive reuse interventions. Ministerial Decree No. 77/2022 [16] provides for two implementation pathways: new construction and the conversion of existing buildings. While the latter represents a strategic solution in terms of sustainability, cost efficiency, and reduction of land consumption, it introduces significant decision-making complexity. Within the implementation of NRRP Mission 6, decisions regarding the conversion of existing buildings have often been conducted on a case-by-case basis, lacking standardized and transparent evaluation frameworks [17], with potential implications in terms of allocative inefficiency and suboptimal resource use. The present study aims to address this gap by proposing a structured, checklist-based multicriteria framework for ex-ante assessment of the suitability of existing buildings for conversion into CHFs.

2 Aim

This study aims to develop a structured decision-support framework for the ex-ante assessment of the functional conversion potential of existing buildings for community-based healthcare functions. The research proposes a multicriteria, checklist-based evaluation model designed to operationalize the assessment of buildings' technical, functional, and performance characteristics. The framework is intended to support public decision-makers by providing a transparent, consistent, and replicable tool for the comparative evaluation of reuse scenarios. It focuses specifically on the assessment of the intrinsic suitability of existing buildings, isolating building-related constraints and potentials within the broader decision-making process.

The study contributes to healthcare planning research by extending the focus beyond new construction and explicitly addressing the evaluation of existing building assets within adaptive reuse processes. From a methodological standpoint, it introduces a structured and scalable model for organizing and operationalizing heterogeneous evaluation criteria within a unified multicriteria framework, providing an operational tool for public administrations involved in the implementation of community-based healthcare policies. The application domain is limited to low-complexity healthcare facilities, with particular reference to CHFs, as defined by Ministerial Decree No. 77/2022. High-complexity hospital facilities are excluded, as they require different evaluation approaches.

3 Methodological Framework

The adaptive reuse of existing buildings is increasingly acknowledged as a relevant strategy in healthcare planning, as it enables the expansion of service capacity through the valorization of the existing building stock, while simultaneously reducing land consumption and implementation time compared to new construction. However, converting buildings for healthcare purposes entails significant technical and functional complexities, since such assets are typically characterized by spatial configurations, structural systems, and building services not originally designed to accommodate healthcare functions. While adaptive reuse represents a potentially more sustainable and cost-effective alternative to new construction [18], this option cannot be considered universally viable, as conversion projects may be constrained by unsuitable structural or dimensional characteristics, excessive refurbishment costs, or stakeholder conflicts [19, 20]. For this reason, a structured ex-ante assessment becomes essential to ensure technical and economic feasibility and to prevent allocative inefficiencies.

Despite the growing relevance of this topic, the academic literature on healthcare planning remains largely focused on the development of new hospital facilities and on location-allocation models. By contrast, the adaptive reuse of existing buildings for low-complexity facilities such as CHFs remains underexplored. This gap is especially evident in the context of M6 – Component 1 of the Italian NRRP, where decisions concerning the reuse of existing assets have often been carried out on a case-by-case basis, in the absence of structured evaluation tools, resulting in limited transparency, consistency, and replicability.

In response to this gap, the present study proposes a structured methodological approach aimed at the ex-ante assessment of the adaptive reuse potential of existing buildings through a checklist-based evaluation model. The framework was developed through the systematic integration of scientific evidence, regulatory references, and technical standards to ensure both methodological robustness and practical applicability. In a first phase, an international literature review was conducted on adaptive reuse and building performance assessment. Given the limited availability of studies specifically addressing the conversion of buildings into healthcare facilities, the review was extended to the broader field of functional conversion. This approach enabled the identification of key evaluation dimensions relevant to assessing reuse potential, while reducing the risk of overlooking critical factors that could compromise project outcomes. The literature analysis highlights that the evaluation of reuse potential should first consider the

dimensional and spatial characteristics of the building, in order to verify its coherence with the intended function. At the same time, the state of conservation and maintenance emerges as a critical indicator, as it directly influences the extent and cost of the interventions required. In this regard, Diana et al. [21] propose a qualitative assessment approach based on the systematic analysis of building components and technical systems, while Langston et al. [22] emphasize the role of physical condition and maintenance in determining reuse feasibility. Alongside these aspects, structural and spatial flexibility—understood as the building's capacity to accommodate new layouts—represents a fundamental prerequisite for successful adaptive reuse processes. Another key dimension concerns energy performance, in line with European sustainability objectives. The building sector accounts for approximately 40% of total energy consumption and 36% of greenhouse gas emissions in the European Union, making the improvement of existing building stock a strategic priority [23, 24]. Within the Italian regulatory framework, the Energy Performance Certificate (EPC), governed by Legislative Decree No. 192/2005 and subsequent amendments, provides a standardized indicator for classifying building energy performance and can therefore be effectively incorporated into comparative evaluation models.

The evidence derived from the literature review made it possible to identify a set of key dimensions that are crucial in assessing the adaptive reuse potential of existing buildings. These dimensions are particularly significant, as deficiencies in these areas typically translate into costly interventions that may ultimately compromise the feasibility of the project. The criteria identified through the literature were subsequently subjected to a process of selection and adaptation to ensure alignment with the research objective and with the specific requirements of low-complexity community healthcare facilities. This process enabled the exclusion of non-relevant dimensions and the reorientation of the framework toward assessing the intrinsic suitability of buildings for healthcare use. The model was further integrated with the Italian technical regulatory framework, incorporating mandatory references concerning accessibility [25], fire safety [26, 27], and energy performance [28]. Additional sources—including the ITACA Protocol and parameters adopted by the Italian Revenue Agency—contributed to the structuring of specific performance criteria and scoring scales.

The discrete scoring scales adopted for each sub-criterion were constructed according to a hierarchical referencing logic. Where mandatory regulatory thresholds exist, the scoring levels directly reflect degrees of compliance with applicable standards: accessibility requirements are grounded in DM 236/1989, fire safety in the Ministerial Decree of 3 August 2015 and DM 29 March 2021, and energy performance in D.Lgs. 192/2005. Where regulatory thresholds are absent, scoring levels were derived from technical planning guidelines—specifically DM 77/2022 and the Agenas/Politecnico di Milano "Quaderni del Metaprogetto"—which define minimum spatial and dimensional requirements for CHFs, or from established building assessment methodologies in the scientific literature [21, 22]. For the state of conservation and maintenance, the three-level classification (critical / intermediate / good condition) aligns with the operational categories adopted by the Italian Revenue Agency for building condition assessment, ensuring a consistent and verifiable classification basis.

The resulting framework takes the form of a hierarchical checklist of criteria and sub-criteria, with each sub-criterion associated with a discrete scoring scale representing increasing levels of suitability. The checklist-based approach translates technical observations into a structured evaluation, ensuring transparency, replicability, and comparability of results. The underlying evaluation logic is based on the coherence between building characteristics and the requirements of the intended healthcare use, enabling the identification of criticalities, estimation of intervention levels, and comparison of alternative options. It is important to note that the framework is intentionally bounded to the intrinsic characteristics of the building, and does not incorporate territorial or locational variables—such as proximity to public transport, presence of services in the catchment area, or urban accessibility indices. These dimensions, while relevant to the overall feasibility of CHF implementation, are considered distinct from the building-specific assessment and can be addressed in complementary evaluation phases, for instance, through GIS-based spatial analysis tools.

4 Structure and Articulation of the Checklist-Based Assessment Framework

The checklist developed in this paper is designed to assess the degree of compatibility of an existing building for its functional conversion into a healthcare facility, with particular reference to low-complexity community-based services (e.g., CHFs). From this perspective, the tool supports the decision-making process by directing attention toward buildings that require a lower level of structural, technical systems, and spatial interventions. The checklist is structured as a hierarchical framework composed of criteria and sub-criteria, enabling the systematic assessment of the main technical, functional, and performance-related dimensions of the building. In particular, it is organized into six main criteria, each representing a distinct analytical dimension relevant to the evaluation of adaptive reuse potential (see Fig. 1): i) building flexibility, ii) state of conservation and maintenance, iii) presence of contaminants and hazardous materials, iv) accessibility, v) compliance with fire safety regulations, and vi) energy performance.

Before applying the proposed framework, it is necessary to clarify that the assessment of a building's suitability for functional conversion into CHFs is carried out only after the verification of a set of preliminary feasibility conditions. These conditions represent requirements for the admissibility of the evaluation, ensuring that the analysis is conducted exclusively on potentially eligible assets. In particular, the application of the checklist presupposes: i) the verification of urban planning compatibility, namely the coherence of the intended healthcare use with the land-use regulations defined by the relevant planning instruments; ii) the absence of restrictive constraints related to landscape protection and hydrogeological risk, which may preclude or significantly limit transformation interventions; and iii) a preliminary verification of dimensional compatibility. With specific reference to the latter, the planning guidelines developed within the "Quaderni del Metaprogetto" for CHFs—promoted by Agenas in collaboration with Politecnico di Milano—indicate that an overall gross floor area of approximately 600 m^2 represents a reference threshold for ensuring adequate service provision. This condition does not imply a rigid threshold, but rather a preliminary screening criterion aimed at

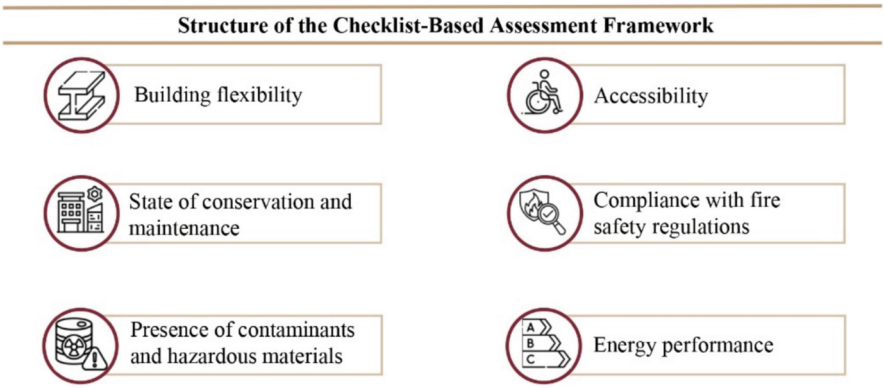


Fig. 1. Structure of the Checklist-Based Assessment Framework. Source: authors' elaboration.

excluding clearly unsuitable cases and ensuring the coherence of the subsequent multicriteria assessment. These preliminary conditions are themselves expressions of the territorial and spatial dimension of feasibility. Urban planning compatibility directly reflects the regulatory and land-use context in which the facility will operate, while the dimensional threshold of 600 m^2 is calibrated against the service catchment area and population demand parameters established by DM 77/2022. The connection between building-level and territorial-level assessment is therefore acknowledged as a relevant integration point, which future extensions of the framework may address through complementary spatial analysis tools. The following sections provide a detailed description of each criterion and the corresponding structure of the evaluation checklist.

4.1 Building Flexibility

The *Building Flexibility* criterion assesses an existing building's ability to accommodate a new intended use through modifications to its spatial layout and/or building systems, without requiring invasive or excessively costly structural interventions. This assessment is central to adaptive reuse processes, as it enables evaluation of the building's structural, spatial, and technical predisposition to accommodate new functions. The criterion is articulated into three main sub-criteria: i) structural system; ii) spatial configuration; iii) building services provisions (Table 1).

Table 1. Assessment scheme for the Building Flexibility criterion. Source: authors' elaboration

Building Flexibility		
Aspect to be assessed	**Score**	**Technical implications**
Structural system		
Load-bearing masonry with dense structural grid (continuous walls; spans < 4–5 m)	**0**	Layout non-modifiable; reconfiguration requires major structural intervention. Negligible flexibility.
Hybrid system (frame + masonry; localized load-bearing elements or structural cores)	**1**	Layout partially modifiable via lightweight partitions and localized openings. Moderate flexibility.
Regular frame structure (RC/steel; spans > 5 m; no internal load-bearing walls)	**2**	Layout fully reconfigurable without structural intervention. High flexibility.
Spatial configuration		
Predominance of rooms < 12 m²; irregular geometry; dense compartmentalization; inefficient circulation (e.g., tortuous corridors, pass-through or non-ventilated spaces)	**0**	Layout incompatible with healthcare functions; requires extensive demolition and full redesign. High cost and time.
Some rooms > 12 m² but irregular distribution or geometry; discontinuous or absent circulation	**0.5**	Limited compatibility with CHF layout; major reconfiguration needed to achieve functional modules (e.g., outpatient rooms ≥ 14 m²).
Rooms ≥ 14 m², partially contiguous or aggregable; partially organized layout; potential main corridor	**1**	Adaptable through selective demolition and internal reconfiguration. Functional baseline achievable.
Regular rooms ≥ 16 m²; partial contiguity; existing or easily achievable main corridor; mainly lightweight partitions	**1.5**	Layout largely compliant; minor interventions required. Low implementation cost.
Regular and contiguous rooms ≥ 16 m²; clear central circulation; lightweight partitions; efficient layout	**2**	Fully compatible layout; no structural intervention required. Immediate adaptability.
Building services provision		
No provisions for systems integration; absence of suspended ceilings and shafts; clear height < 2.80 m	**0**	New systems require invasive structural works and demolition. No integration capacity.
Adequate clear height (> 3.30 m) but no existing provisions; no ceilings or shafts; non-load-bearing partitions	**0.5**	Limited system integration (exposed installations or minor wall chases).
Partial provisions; suspended ceilings (20–60%); vertical shafts along at least one axis; systems partially divisible; at least one technical room per floor	**1**	System expansion feasible without structural works. Moderate flexibility with minor disruptions.
Good provisions; ceilings ≥60% (service zone > 35 cm); continuous shafts; horizontal distribution paths; systems divisible by functional areas	**1.5**	Complex system reconfiguration feasible with limited interventions. High adaptability.
Fully integrated and accessible systems; ceilings ≥90% (service zone > 40 cm); dense access points; continuous vertical and horizontal distribution	**2**	Plug-and-play adaptability. No demolition required. Minimal intervention.

The ***Structural System*** sub-criterion assesses the building's capacity for spatial reconfiguration as determined by its load-bearing structure. Load-bearing masonry systems with continuous walls and limited spans constrain layout modifications, whereas regular frame structures (reinforced concrete or steel) allow greater adaptability. The assessment is based on a three-level scale (0–2), reflecting increasing degrees of structural flexibility and associated intervention requirements. The ***Spatial Configuration*** sub-criterion assesses the current layout's compatibility with the CHF's functional and dimensional requirements. It considers room size, geometric regularity, spatial continuity, and circulation efficiency, capturing the extent of reorganization needed for functional adaptation. The evaluation is conducted through a five-level scale (0–2), designed to reflect progressive conditions of layout compatibility and corresponding transformation effort. The ***Building Services Provision*** sub-criterion assesses the building's capacity to accommodate, integrate, and reorganize technical systems. It focuses on the presence and accessibility of service infrastructure (e.g., ceilings, shafts, distribution paths) as key enablers of system adaptability. The assessment adopts a five-level scale (0–2), reflecting increasing levels of infrastructural readiness and decreasing intervention intensity.

Overall, the Building Flexibility criterion provides an integrated evaluation of the building's structural, spatial, and infrastructural adaptability, capturing its intrinsic capacity to support functional conversion with varying levels of intervention.

4.2 State of Conservation and Maintenance

The *State of conservation and maintenance* criterion assesses the level of degradation and the functional efficiency of the main building components and technical systems. Based on the integration of academic literature and regulatory references, the criterion is structured into 9 sub-criteria, covering structural components, envelope elements, internal finishes, and main technical systems, allowing for a comprehensive evaluation of the building's overall condition. Each sub-criterion is evaluated using a discrete three-level scoring scale, consistent with the operational categories adopted by the Italian Revenue Agency for building condition assessment and with established component-based assessment approaches in the literature [21], as detailed in Sect. 3: i) 0—critical condition: extensive degradation or failure, components require replacement or major rehabilitation; ii) 1—intermediate condition: localized degradation or partial functionality, minor or moderate interventions required; iii) 2—good condition: fully functional components with no significant maintenance requirements. This scoring system enables a consistent and comparable assessment of building conditions, supporting the identification of critical elements that may significantly affect the technical and economic feasibility of adaptive reuse interventions (Table 2).

The articulation of the State of conservation and maintenance criterion enables the quantification of the building's degradation level and supports the prioritization of intervention areas requiring rehabilitation or upgrading.

Table 2. Assessment scheme for the State of conservation and maintenance criterion. Source: authors' elaboration

State of conservation and maintenance		
Aspect to be assessed	**Score**	**Technical implications**
Load-bearing structure (beams, columns, walls, slabs)		
Structural damage (cracks, deformation, detachment, corroded reinforcement)	**0**	Compromised structural integrity; detailed assessment and strengthening required
Localized, non-critical damage; no stability issues	**1**	Minor inspections and localized maintenance required
No visible damage; structurally sound and stable	**2**	Fully compliant; no structural intervention required
Roof		
Active leaks, widespread degradation, damaged roofing layers	**0**	High risk of deterioration; full refurbishment required
Irregular condition, worn materials, no active leaks	**1**	Functionally acceptable; localized maintenance required
Intact roof, no leaks or defects	**2**	Fully functional; no intervention required
Faąades (plaster, cladding, cornices)		
Detachment, cracks, unsafe elements	**0**	Safety risk; urgent repair required
Surface degradation (cracks, stains, mould), no structural issues	**1**	Aesthetic/functional degradation; maintenance required
Uniform, well-maintained surfaces	**2**	No intervention required
Windows and doors (condition and thermo-acoustic performance)		
Damaged or non-functional frames; air/water leakage	**0**	Inadequate performance; full replacement required
Functional but inefficient (poor insulation, outdated systems)	**1**	Replacement or upgrading recommended
Fully functional, good insulation performance	**2**	Suitable for use; no intervention required
Internal finishes (walls and ceilings)		
Widespread degradation (moisture, mould, detachment)	**0**	Unsuitable for use; rehabilitation required
Localized degradation; no hygiene issues	**1**	Repairable with minor interventions
Intact, dry, washable surfaces	**2**	Suitable for healthcare use; no intervention required
Flooring		
Damaged, non-hygienic or unsafe flooring	**0**	Full replacement required
Usable but worn or outdated surfaces	**1**	Medium-term refurbishment recommended
Continuous, resistant, hygienic surfaces	**2**	Fully compliant, no intervention required

(*continued*)

Table 2. (*continued*)

Electrical system		
Non-functional or unsafe system; exposed or obsolete wiring	**0**	Critical safety condition; full system replacement required
Partially functional or outdated system	**1**	Upgrading required (e.g., panels, wiring)
Compliant and fully functional system	**2**	Suitable for use; no intervention required
Plumbing system		
Non-functional system; leaks, damaged pipes, no water points	**0**	Full replacement required
Partially functional; outdated components	**1**	Upgrading required; limited reliability
Fully functional and compliant system	**2**	Suitable for use; no intervention required
HVAC system		
Absent or non-functional system	**0**	Full installation required
Obsolete or inefficient system	**1**	Upgrading required; limited performance
Efficient and compliant system	**2**	Suitable for continuous use

4.3 Presence of Contaminants and Hazardous Materials

The *Presence of hazardous materials and contaminants* criterion introduces an evaluative dimension related to the environmental and hygienic safety of the building, accounting for potential critical issues associated with the presence of hazardous substances or materials subject to mandatory remediation. These factors may significantly affect the implementation time, intervention costs, and overall technical feasibility of the conversion process. The criterion aims at assessing the environmental suitability of the building in compliance with the applicable regulatory framework. The evaluation is based on a discrete scoring scale (0–2), reported in Table 3.

Table 3. Assessment scheme for the Presence of hazardous materials and contaminants criterion. Source: authors' elaboration

Presence of hazardous materials and contaminants		
Aspect to be assessed	**Score**	**Technical implications**
Widespread presence of hazardous contaminants (e.g., friable asbestos, hydrocarbons, PCB, lead, mould, soil contamination) or materials requiring mandatory remediation	**0**	Mandatory environmental remediation required. Reuse feasibility severely compromised
Localized or non-friable contaminants; materials potentially containing hazardous substances (e.g., encapsulated asbestos, sealants, tanks) removable without invasive works	**1**	Reuse feasible, subject to targeted removal or environmental verification. Impacts on costs and implementation
No documented or visible evidence of contaminants; previously remediated or certified materials	**2**	Environmentally suitable. No remediation required

4.4 Accessibility

The *Accessibility* criterion evaluates the level of physical usability of the building by verifying the absence of architectural barriers that may hinder access, circulation, and use of spaces by users with disabilities or reduced mobility—a fundamental requirement for healthcare facilities to ensure safe, autonomous, and inclusive use. The criterion assesses the degree of compliance with the dimensional and performance requirements established by Ministerial Decree No. 236/1989, while identifying any necessary upgrading interventions. It is structured into four sub-criteria: i) main building access; ii) vertical circulation; iii) horizontal circulation; iv) sanitary facilities. Each sub-criterion is assessed through a discrete scoring scale, allowing the progressive classification of accessibility levels from critical conditions to full regulatory compliance. The scoring scales are differentiated according to the specific technical complexity associated with each sub-criterion (Table 4). This approach allows the evaluation to account for the specific technical characteristics of each component, avoiding oversimplification.

Table 4. Assessment scheme for the Accessibility criterion. Source: authors' elaboration

Accessibility		
Aspect to be assessed	**Score**	**Technical implications**
Main building access		
Presence of architectural barriers preventing access (stairs >1.10 m without lift; entrance doors <0.75 m; no ramp)	**0**	Inaccessible entrance; major interventions required (lift installation and/or doorway widening)
Stair >1.10 m; entrance door ≥0.85 m; no ramp	**0.5**	Partially accessible; ramp installation or lift required
Stair >1.10 m; entrance door <0.75 m; no ramp	**1**	Limited adaptation required (door widening); vertical accessibility feasible
Stair ≤1.10 m; entrance door ≥0.75 m; non-compliant ramp (slope >8%, width <0.90 m)	**1.5**	Partially compliant; ramp upgrading required
Compliant ramp (slope ≤8%, width ≥0.90 m) and accessible entrance	**2**	Fully accessible; no intervention required
Vertical circulation (lifts/platform lifts)		
No lifting systems; level differences only via stairs; no predisposition or space for future installation	**0**	Complete vertical inaccessibility; structural interventions required
Lift present but non-compliant: cabin < 0.80×1.20 m; landing < 1.40×1.40 m; manual doors; platform lift absent or non-functional	**0.5**	Severe functional limitations; accessibility strongly compromised; replacement or alternative solutions required
Lift present with cabin ≥ 0.80×1.20 m but critical issues: reduced landing (<1.20×1.20 m), missing signaling devices or automatic opening	**1**	Partial accessibility; possible upgrades without full replacement; localized interventions on devices and spaces
Lift compliant with DM 236/1989: cabin ≥ 1.10×1.40 m; landing ≥ 1.40×1.40 m; automatic doors; acoustic/visual/tactile signals; controls at compliant height	**1.5**	Full accessibility ensured; no intervention required; independent use guaranteed
Horizontal circulation		
Corridors ≤1.00 m; doors <0.75 m; presence of steps or level differences	**0**	Severe mobility limitation; major structural interventions required
Corridors ≥1.10 m but ≤1.20 m; doors ≥0.75 m but <0.85 m; limited maneuverability	**1**	Partial accessibility; selective widening and layout adjustments required
Corridors ≥1.20 m; doors ≥0.85–0.90 m; no steps; adequate maneuvering space	**2**	Fully compliant; no significant barriers
Sanitary facilities		
No accessible restroom; insufficient space (<1.40×1.40 m); inadequate door width; no maneuvering space	**0**	Not suitable; full redesign required
Restroom present but partially compliant (adequate size but missing equipment or insufficient door width)	**1**	Adaptation possible with fixture replacement; no major structural works
Fully compliant accessible restroom (DM 236/1989: adequate space, equipment, maneuverability)	**2**	Fully accessible; no intervention required

4.5 Compliance with Fire Safety Regulations

Compliance with fire safety regulations represents a mandatory requirement for the authorization of healthcare activities. Within the proposed framework, this criterion assesses the building's ability to ensure adequate safety conditions in the event of fire, with particular reference to the usability of escape routes and the fire resistance of materials and structural elements. The methodological approach is based on the Italian Fire Prevention Code (Ministerial Decree of August 3, 2015, and subsequent amendments) and on the Ministerial Decree of March 29, 2021 (Vertical Fire Safety Regulation for healthcare facilities). Although outpatient healthcare facilities are characterized by a lower risk level compared to inpatient hospital units, they remain subject to minimum mandatory requirements concerning means of egress, fire reaction and resistance of materials, and emergency management. Accordingly, the criterion is structured into two sub-criteria: i) means of egress; ii) fire resistance of materials and structures. Each sub-criterion is evaluated through a discrete scoring scale (0–2) directly reflecting degrees of regulatory compliance with the applicable normative framework (Table 5).

Table 5. Assessment scheme for Compliance with the fire safety regulations criterion. Source: authors' elaboration

Compliance with fire safety regulations		
Aspect to be assessed	**Score**	**Technical implications**
Means of egress		
Single exit per floor; width <0.80 m; no direct access to a safe place (no protected staircase or external exit)	**0**	Critical condition; high evacuation risk. Major interventions required (new stairs, route adaptation)
Two exits present but not independent (same compartment) or insufficient width (<0.80 m)	**1**	Partial safety; upgrades required (compartmentation, door widening)
Two independent, clearly marked exits; compliant dimensions (≥1.20 m); protected staircase or direct access to a safe place	**2**	Fully compliant; safe evacuation conditions ensured
Fire resistance of materials and structures		
Widespread combustible materials (light structures, false ceilings, non-certified partitions); no fire resistance certification	**0**	High fire vulnerability, rapid spread, and structural risk. Major upgrading required
Partially combustible materials; incomplete or missing fire resistance documentation	**1**	Intermediate condition; improvement possible through material replacement and certification
Non-combustible materials; structure with certified fire resistance (REI ≥60); no hazardous finishes	**2**	Fully compliant; no intervention required

4.6 Energy Performance

The Energy performance criterion aims to evaluate the overall energy performance of the building within the assessment framework. The evaluation is based on the Energy Performance Certificate (EPC), a standardized and legally recognized indicator that synthesizes the energy efficiency of both the building envelope and the main technical systems, ensuring an objective and comparable assessment regardless of typological or dimensional differences among buildings. In accordance with Legislative Decree No. 192/2005 and subsequent amendments, the scoring scale directly reflects the 10 EPC energy classes defined by law, ranging from G (lowest performance, score = 0) to A4 (highest performance, score = 4.5), with each class associated with a progressively increasing score proportional to the energy performance level (Table 6).

Table 6. Assessment scheme for the Energy performance criterion. Source: authors' elaboration

Energy class (EPC)	Score
G	**0**
F	**0,5**
E	**1**
D	**1,5**
C	**2**
B	**2,5**
A1	**3**
A2	**3,5**
A3	**4**
A4	**4,5**

5 Aggregation and Interpretation of Results

A structured and comparable interpretation of the evaluation results requires the definition, for each criterion, of the range of achievable scores, identified by establishing the minimum value (set to 0) and the maximum value derived from the sum of scores associated with the respective sub-criteria. Table 7 reports, for each of the six criteria, the extent of the evaluation scale and the corresponding maximum attainable score.

Table 7. Scoring ranges and maximum attainable values for each evaluation criterion based on the aggregation of sub-criteria. Source: authors' elaboration.

CRITERIA	MIN SCORE	MAX SCORE
Building flexibility	0	6
State of conservation and maintenance	0	18
Presence of contaminants and hazardous materials	0	2
Accessibility	0	7,5
Compliance with fire safety regulations	0	4
Energy Class (EPC)	0	4,5
Total	**42**	

Once the overall score for each criterion has been determined, the results are normalized using a Min–Max linear transformation, made possible by the finite and homogeneous numerical structure of the adopted scoring system. The minimum value min(x) always corresponds to 0, while the maximum value max(x) varies depending on the criterion. The linear transformation is defined as follows:

$$I_i = \frac{x_i}{\max(x)}$$

where x_i represents the score obtained by the building for criterion i, and max(x) corresponds to the theoretical maximum score for the same criterion. The normalized indicators assume a standardized quantitative form ranging between 0 and 1, expressing the degree of suitability of the building for conversion into a CHF, while enabling the identification of critical areas (values close to 0) and higher-performing aspects (values close to 1). In addition to the criterion-level analysis, an overall synthetic measure is obtained through score aggregation: the total score ranges between 0 and 42, and its normalization—obtained by dividing by 42—expresses overall building performance on a 0–1 scale. This dual level of interpretation supports both the identification of specific technical and functional criticalities and the comparison of alternative options, facilitating public decision-making processes.

6 Conclusion and Future Insights

The increasing centrality of strategies aimed at strengthening community-based healthcare, particularly evident during the COVID-19 pandemic, has highlighted the need for operational tools capable of systematically supporting decision-making processes related to proximity healthcare facilities. In this context, the adaptive reuse of existing building stock represents a strategic solution, although one characterized by significant technical and decision-making complexity [29]. This study proposes a decision-support framework for the ex-ante assessment of the suitability of existing buildings for conversion into CHFs, configured as a structured multicriteria system based on a hierarchical checklist integrating technical, functional, and performance-related criteria derived from

scientific literature, regulatory frameworks, and operational practice. The use of discrete evaluation scales, combined with the normalization of results, enables the translation of qualitative observations into standardized quantitative indicators, ensuring transparency, replicability, and comparability.

From a methodological perspective, the main contribution lies in the development of an operational tool that isolates and evaluates the building component within the decision-making process through the assessment of intrinsic suitability, allowing a clear distinction between technical-functional building conditions and other decision dimensions—locational, economic, and organizational. From an applied perspective, the model assists public decision-makers in identifying key technical criticalities and comparing alternative options, promoting a more efficient allocation of resources.

Despite these strengths, some limitations remain. The absence of a weighting system implies equal contribution of all criteria, without reflecting decision priorities or contextual specificities. In this regard, it is worth noting that certain criteria may function as practical deal-breakers in real-world decision-making contexts: a score close to zero on fire safety compliance or on the presence of hazardous contaminants would likely undermine overall conversion feasibility regardless of performance on other dimensions, such as energy class or spatial configuration. A sensitivity analysis testing the stability of the overall suitability index under alternative weighting schemes—assigning greater importance to safety-critical criteria—is therefore identified as a priority for future methodological development. Moreover, the framework currently focuses exclusively on intrinsic building characteristics, excluding territorial, economic, and managerial variables that may significantly affect overall feasibility.

Future developments may extend the model toward a more comprehensive decision-support system integrating additional evaluation dimensions. The introduction of multi-criteria weighting techniques aligned with decision-makers' preferences [30] and integration with GIS-based tools for spatial analysis appear particularly relevant in this regard. Furthermore, the integration of the proposed checklist into BIM (Building Information Modelling) or Digital Twin environments represents a promising avenue aligned with current trends in Healthcare 4.0 [31], enabling dynamic updating of evaluation data and more efficient management of decision-making workflows in adaptive reuse planning. It should be noted that the framework has not yet been applied to empirical case studies: its validation through the systematic assessment of a heterogeneous set of existing buildings—spanning different typologies, construction periods, and maintenance conditions—is identified as the most urgent step toward demonstrating its operational reliability and identifying potential refinements. Overall, the proposed framework represents a first step toward the development of operational evaluation tools supporting policies aimed at strengthening community-based healthcare, contributing to bridging the gap between theoretical approaches and practical applications in healthcare planning.

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