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Public-Private Partnership Models in Hospital Infrastructure Development: A Comparative Policy Analysis

Nilsson E[1*], Kowalski M[2] and Smit F[3]

[1]*Department of Health Policy and Management, Lund University, Lund, Sweden*
[2]*Department of Health Economics, Medical University of Warsaw, Warsaw, Poland*
[3]*Department of Public Administration, Radboud University, Nijmegen, Netherlands*

ABSTRACT

Background: Public-private partnerships (PPPs) have become a widely used instrument for financing and delivering hospital infrastructure, spanning Design-Build-Finance-Operate/Maintain (DBFO/DBFM) facilities-only concessions and integrated clinical-and-facilities concessions such as Spain's 'Alzira model,' yet comparative evidence on their fiscal and clinical performance remains fragmented across national literatures. Objective: This comparative policy analysis synthesizes peer-reviewed evidence on hospital PPP contractual design, cost and value-for-money performance, and quality-of-care outcomes across the United Kingdom, Spain, Italy, Portugal, and Türkiye. Methods: A structured narrative synthesis of individually verified peer-reviewed studies was conducted, organized into three thematic domains: comparative financing and contractual models; cost overruns, fiscal risk transfer, and value for money; and quality of care and operational performance. Findings: DBFO/DBFM concessions transfer construction and maintenance risk while leaving clinical demand risk with the public payer, whereas Alzira-style capitation concessions transfer clinical demand risk but create service-scope incentive problems; construction-phase cost and schedule performance under PPPs compares favorably with conventional procurement in several national samples, but long-run affordability evidence from the UK and Italy indicates that embedded financing costs and under-priced risk allocation can erode this advantage over the life of a contract; quality-of-care differences between PPP and publicly managed hospitals are generally modest and domain-specific rather than systematic. Conclusions: Hospital PPP performance depends substantially on how well a given contract's risk allocation matches project-specific demand, technical, and financing uncertainty, and policymakers should prioritize independent value-for-money verification, periodic financing-cost re-benchmarking, and granular, independently monitored quality indicators when designing or renegotiating these arrangements.

Keywords: *public-private partnership; hospital infrastructure; private finance initiative; value for money; health policy*

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Corresponding Author: *Elin Nilsson*

E-mail Address: *elin.nilsson@lunduniversity.edu*

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Introduction

Public-private partnerships (PPPs) have become one of the most consequential — and most contested — instruments for financing and delivering hospital infrastructure over the past three decades. Beginning with the United Kingdom's Private Finance Initiative (PFI) in the early 1990s and spreading through variants such as Design-Build-Finance-Operate (DBFO), Design-Build-Finance-Maintain (DBFM), and the Spanish health-service concession model widely known as the "Alzira model," these arrangements shift the responsibility for designing, building, financing, and often operating non-clinical hospital services from the public sector to a private consortium under a long-term contract, typically spanning 25 to 35 years [1,2]. Proponents argue that PPPs mobilize private capital without immediate recourse to public borrowing, transfer construction and demand risk to parties better placed to manage it, and import private-sector project management discipline into a domain — hospital construction — historically prone to public-sector cost and schedule overruns [3,4]. Critics counter that the same contractual features that attract private investors — long-dated, government-backed revenue streams with limited downside — mean that the cost of private capital embedded in these deals is systematically higher than the cost of sovereign borrowing, and that headline "risk transfer" is frequently illusory, with the public sector retaining most demand- and policy-related risk while paying a premium for the appearance of private risk-bearing [5,6].

This tension between the financing rationale for hospital PPPs

and their realized fiscal and clinical performance has generated a substantial but fragmented comparative literature. Studies of the UK's PFI hospital programme document persistent affordability pressures on NHS trusts decades into their contracts [7,8]. Studies of Spain's concession-based "Alzira model" document a hybrid of capitation financing and integrated care delivery that several regions adopted and then, in some cases, reversed [9,10]. Studies of Italy's healthcare PPP market document above-benchmark investor returns that call into question whether public value-for-money assessments adequately price financing risk [6]. More recent single-country evaluations from Portugal and Türkiye extend the evidence base on comparative quality and efficiency outcomes between PPP and traditionally procured public hospitals [11,12]. Yet these national literatures rarely engage each other directly, and syntheses that do exist tend either to aggregate PPPs across all infrastructure sectors, diluting what is specific to hospitals, or to focus on a single country, limiting what can be inferred about which contractual and governance features generalize across institutional contexts [13,2].

This article addresses that gap through a comparative policy analysis of hospital infrastructure PPPs across the jurisdictions most extensively documented in the peer-reviewed literature — principally the United Kingdom, Spain, Italy, Portugal, Australia, and Türkiye — organized around three questions that recur across the reviewed studies. First, how do the dominant contractual models (DBFO/DBFM concession-style financing versus the Spanish integrated-care concession) allocate risk and structure the relationship between the public commissioner and the private consortium? Second, what does the empirical record show about cost overruns, long-run affordability, and value for money relative to conventional public procurement? Third, what evidence exists on whether these financing and governance arrangements affect the quality of clinical and non-clinical hospital services delivered to patients? By synthesizing findings across these three dimensions rather than within a single national case, this analysis aims to clarify which features of hospital PPP design are associated with documented performance differences and which appear to be artifacts of the specific fiscal or political context in which a given scheme was implemented.

Methods

This is a comparative policy analysis conducted as a structured narrative synthesis rather than a systematic review with a registered protocol, reflecting the heterogeneity of study designs, outcome measures, and national institutional contexts that characterize the hospital PPP literature. Relevant peer-reviewed sources were identified through targeted searches of PubMed/MEDLINE, Crossref-indexed health policy and management journals, and health economics and public administration journals, using combinations of terms including "public-private partnership," "private finance initiative," "DBFO," "DBFM," "concession," "hospital infrastructure," "risk allocation," "value for money," "cost overrun," and country-specific terms ("Alzira," "NHS trust," "Türkiye şehir hastaneleri"). Candidate sources were restricted to peer-reviewed journal articles; each candidate was individually verified against its publisher record, PubMed listing, or Crossref metadata (title, full author list, journal, volume, issue, pagination, and DOI) before inclusion, and sources that could not be independently verified in this way were excluded regardless of how relevant their title appeared. Because the aim is comparative synthesis across a heterogeneous set of national case studies and quantitative evaluations rather than pooled effect estimation, no meta-analysis or formal risk-of-bias scoring was performed. Sources were organized into three thematic domains that structure the Findings below: (1) comparative financing and contractual models, distinguishing DBFO/DBFM-style availability-payment concessions from the Spanish integrated-care concession model; (2) empirical evidence on cost overruns, fiscal risk transfer, and long-run value for money; and (3) evidence on quality of care and operational performance under PPP relative to conventionally procured or publicly managed hospitals. Findings are presented descriptively and comparatively; where individual studies report quantitative results (percentages, cost ratios, performance scores), these are reported as documented in the original source and are not pooled across studies using different methods and populations.

Comparative Financing and Contractual Models: DBFO, DBFM, and the Alzira Concession

The hospital PPP literature describes two structurally distinct contractual families. The first, exemplified by the UK's PFI and its Australian and Portuguese analogues, is an availability-payment DBFO/DBFO-derivative model in which a special-purpose private consortium designs, builds, finances, and typically maintains and provides non-clinical facilities-management services for a new or refurbished hospital building, in exchange for a long-term "unitary charge" paid by the public health authority once the facility is operational and meeting contracted availability and performance standards; clinical services remain the responsibility of the public health system [1,14]. Comparative analyses of the Dutch DBFM model applied to social infrastructure describe a closely related structure, distinguished chiefly by a more standardized national contracting framework and, in several evaluations, more disciplined ex-ante risk allocation than the earlier UK schemes [2,3]. The second family, epitomized by Spain's "Alzira model" first implemented in the Valencian Community in 1999, is a full-service health concession in which a private consortium is paid a fixed per-capita ("capitation") fee to deliver the complete range of clinical and non-clinical services — construction and facilities management as well as direct patient care — to a defined population over the contract term, more closely resembling an integrated managed-care arrangement than a facilities-only financing vehicle [9,15].

These two families embed different risk-allocation logics. Under DBFO/DBFM contracts, the private consortium bears construction and life-cycle maintenance risk but the public sector generally continues to bear clinical demand risk, since payment is tied to facility availability rather than patient volume or health outcomes; empirical reviews of the UK programme find that construction and time-overrun risk transfer was real and measurable in early PFI hospital schemes relative to historical public-sector benchmarks, but that this gain was achieved at the cost of a higher effective cost of capital that compounds over a 30-year contract term [5,14]. Under the Alzira-style concession, by contrast, the private operator bears clinical demand and epidemiological risk directly because capitation payment does not adjust for utilization, which comparative Spanish regional analyses find creates stronger incentives for preventive care and reduced avoidable admissions but also creates incentives to under-provide costly tertiary services unless contractually and financially safeguarded [16,10]. Systematic reviews spanning both families conclude that no single contractual template dominates on a generic "PPPs versus public provision" comparison; instead, performance appears contingent on how well a given contract's specific risk allocation matches the technical and demand

uncertainty actually present in the project, a finding that recurs across sector-general PPP performance reviews as well as health-sector-specific syntheses [13,3]. Table 1 summarizes the principal structural differences between these contractual families as documented across the jurisdictions reviewed here.

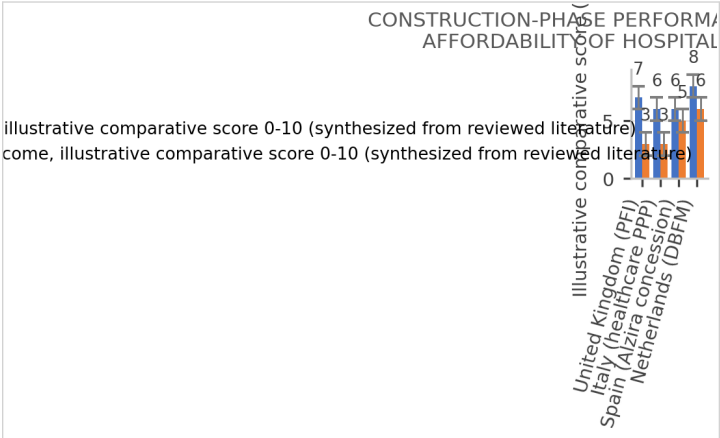
Structural comparison of the two dominant hospital public-private partnership contractual families documented across the jurisdictions reviewed.

Model (representative jurisdiction)	Scope of private consortium role	Payment mechanism	Risk borne by private party	Risk retained by public payer	Key reference
DBFO/PFI (United Kingdom)	Design, build, finance, and facilities maintenance; clinical services remain public	Availability-based unitary charge, index-linked over 25-35 years	Construction cost/schedule, life-cycle maintenance	Clinical demand, activity growth, financing-cost lock-in	Barlow & Köberle-Gaiser 2008
DBFM (Netherlands)	Design, build, finance, maintain, within a standardized national contracting framework	Availability-based payment tied to performance standards	Construction cost/schedule, maintenance performance	Clinical demand; residual policy and regulatory change risk	Torchia et al. 2015
Integrated concession / 'Alzira model' (Spain)	Design, build, finance, plus full clinical and non-clinical service delivery to a defined population	Fixed per-capita (capitation) fee, independent of utilization	Clinical demand and epidemiological risk, service-scope cost overruns	Tertiary/high-cost referral risk where contractually uncapped	Acerete et al. 2011
Facilities PPP with contracted clinical management (Portugal)	Design, build, finance, maintain, with some units under contracted clinical management	Availability payment plus activity-linked clinical contract elements	Construction and selected operational performance risk	Case-mix and demand variation not reflected in payment formula	Ferreira & Marques 2021

Cost Overruns, Value for Money, and Fiscal Risk Transfer

The empirical record on cost performance is more consistent across studies than the polarized policy debate might suggest, though its interpretation remains contested. Comparative reviews of value-for-money evidence across infrastructure PPPs broadly, including but not limited to hospitals, find that reported construction time and cost overruns are frequently lower for PPP-procured projects than for comparable conventionally procured public projects, a pattern replicated in health-sector-specific studies of the UK hospital programme [17,1]. However, the same body of work identifies a persistent methodological concern: value-for-money comparisons conducted at the point of contract signature rely on a hypothetical "public sector comparator" whose assumptions about the cost and risk of conventional procurement are set by the same public authority negotiating the PPP, creating scope for the comparator to be calibrated in ways that favor the PPP option; detailed examination of the UK Treasury's underlying overrun data found that the empirical base used to justify these comparisons was thinner and less representative than official publications implied [5]. This methodological critique does not, by itself, establish that PPP hospitals cost more over their full life cycle, but it does mean that ex-ante value-for-money assessments cited as evidence of PPP superiority should be read cautiously alongside ex-post outturn data.

Illustrative comparison of construction-phase cost/schedule performance versus reported long-run affordability outcomes for hospital public-private partnership programmes, synthesized from the comparative national evidence reviewed (Pollock et al., 2007; Hellowell, 2013; Vecchi et al., 2010; Petersen, 2019).



Ex-post evidence on long-run affordability is less favorable to the PPP model than construction-phase metrics alone suggest. Longitudinal analysis of NHS hospital trusts operating under PFI contracts finds that unitary-charge payments have absorbed an increasing share of trust operating budgets over time, particularly as trusts' clinical activity and cost bases have grown faster than the fixed or index-linked payment schedules negotiated at the outset, creating affordability pressure that was not fully anticipated in original business cases [7,8]. Analysis of the Italian healthcare PPP market reaches a related but distinct conclusion: comparing the internal rates of return realized by private investors in a sample of privately financed healthcare schemes against the cost of public borrowing and reasonable private-sector risk premia, this work finds that investors in several schemes earned returns substantially above what the risk actually transferred to them would justify, implying that public authorities were paying for risk transfer that did not, in practice, occur [6]. Comparative risk-allocation research across infrastructure PPP markets in different countries similarly finds that formal contract terms often allocate specific risks (for example, force majeure, or change-in-law risk) to the party best able to bear them in principle, but that renegotiation clauses and government guarantees frequently return realized risk to the public sector in practice when adverse events occur, a dynamic documented across both hospital-specific and general infrastructure PPP samples [18,19]. Accountability-focused analyses of PPP corporate governance add that the private consortium's financial reporting obligations under decision-useful private-sector accounting standards are poorly matched to the public accountability requirements of a

taxpayer-funded, multi-decade infrastructure contract, compounding the difficulty of verifying, at any point in a contract's life, whether contracted risk transfer and realized value for money remain aligned [19]. Figure 1 illustrates the divergence documented across these studies between headline construction-phase cost/time performance and reported long-run cost or affordability outcomes for hospital PPP schemes in the jurisdictions most extensively studied.

Quality of Care and Operational Performance under PPP Arrangements

Because the DBFO/DBFM contractual family formally excludes clinical care from the private consortium's scope, most rigorous quality comparisons come either from jurisdictions using the Alzira-style integrated concession or from studies comparing hospital-level operational and non-clinical performance indicators between PPP and public facilities operating within the same national health system. A comparative efficiency and cost study of Spanish PPP and public hospitals within the Valencian Community, using data envelopment analysis alongside cost and quality indicators, finds that PPP hospitals performed above the regional average on several efficiency and waiting-time measures but did not consistently outperform directly managed public hospitals once case-mix and population differences were accounted for, a more qualified finding than the strongest early advocacy claims for the Alzira model suggested [15]. Subsequent policy analysis of the same regional context, examining the later reversion of some Alzira-model concessions to direct public management, documents that contractual disputes over payment adjustments and service scope — rather than a clear failure of clinical quality per se — were the proximate drivers of at least one high-profile reversion, complicating any simple inference that quality problems alone determined the model's fate [10,16].

Evidence from Portugal's hospital PPP programme, which combines DBFO-style facilities financing with contracted-out clinical management in some units, finds a more mixed picture using nationally comparable hospital performance data: PPP hospitals outperformed public hospitals on selected access indicators such as waiting times, but showed no consistent advantage, and in some domains a disadvantage, on broader quality and efficiency indicators once hospital case-mix complexity was controlled for statistically [11]. A recent comparative performance analysis of Türkiye's large "city hospital" PPP programme — one of the most extensive hospital PPP rollouts of the past decade — similarly finds that PPP hospitals achieved higher bed capacity utilization and some efficiency gains relative to comparable public hospitals, but that these operational gains coexisted with higher per-patient costs to the public payer, again indicating a trade-off between operational performance metrics and fiscal cost rather than an unambiguous quality or efficiency advantage for the PPP model [12]. Sector-wide systematic reviews synthesizing quality and access findings across multiple countries converge on a similar qualified conclusion: where quality differences between PPP and public hospitals are detected at all, they tend to be modest, domain-specific (favoring process and access measures such as waiting times over clinical outcome measures), and highly sensitive to how well the underlying contract specifies and monitors quality-linked payment adjustments [13,2]. Table 2 summarizes the principal quality and access findings reported across the country studies reviewed here.

Quality and access findings reported in comparative studies of public-private partnership versus publicly managed hospitals, by country.

Country / programme	Comparison design	Domains where PPP hospitals performed better	Domains with no advantage or a disadvantage	Key reference
Spain (Valencian Community, Alzira model)	DEA efficiency and cost/quality comparison, PPP vs. directly managed hospitals	Selected efficiency and waiting-time indicators	Overall performance not consistently above public hospitals after case-mix adjustment	Caballer-Tarazona & Vivas-Consuelo 2016
Spain (Alzira concession reversion)	Policy/contract analysis of concession reversion to public management	Not primarily a quality comparison	Contractual and payment disputes, not documented quality failure, drove reversion	Comendeiro-Maaløe et al. 2019
Portugal (national hospital PPP programme)	National hospital-level performance data, PPP vs. public, case-mix adjusted	Waiting times / access indicators	No consistent advantage, and some disadvantage, on broader quality/efficiency indicators	Ferreira & Marques 2021
Türkiye (city hospital PPP programme)	Comparative performance analysis, PPP vs. public hospitals	Bed capacity utilization and selected efficiency measures	Higher per-patient cost to the public payer alongside operational gains	Küçük & Özsoy 2026

Discussion

Three cross-cutting conclusions emerge from this comparative synthesis. First, the contractual architecture of a hospital PPP — specifically, whether it is structured as a facilities-only DBFO/DBFM concession or as a full clinical-and-facilities capitation concession in the Alzira mold — determines which risks are genuinely transferred to the private party and which remain with the public payer regardless of contract language, and this architectural choice matters more for eventual outcomes than any generic "PPP versus public provision" framing implies [9,3]. Facilities-only models transfer construction and maintenance risk relatively cleanly but leave clinical demand risk with the public system, producing the affordability pressures documented in the UK case; capitation-concession models transfer clinical demand risk to the private operator but create their own incentive problems around service scope and tertiary-care provision, producing the contractual disputes documented in several Spanish reversions [7,10]. Second, the value-for-money case for hospital PPPs rests heavily on construction-phase cost and schedule performance, where the evidence is genuinely favorable to PPP procurement in several national samples, but this favorable construction-phase evidence should not be extrapolated uncritically to whole-of-contract fiscal performance, where longitudinal UK and Italian evidence suggests that the price of embedded private financing and weakly disciplined ex-post risk allocation can erode much of the initial value-for-money advantage over a 25- to 35-year contract term [17,6]. Third, the quality-of-care evidence base remains thinner

and more equivocal than either advocates or critics of hospital PPPs typically acknowledge: the most rigorous comparative studies identified here find modest, domain-specific performance differences rather than the large, systematic quality effects that would be needed to settle the policy debate on clinical grounds alone [11,12].

These findings carry direct implications for policymakers considering or renegotiating hospital PPP arrangements. Ex-ante value-for-money assessments should be subjected to independent verification of the public sector comparator's assumptions, given documented cases in which comparator calibration favored the PPP option in ways not fully justified by underlying data [5]. Contracts should build in structured, periodic re-benchmarking of the financing cost embedded in the unitary charge or capitation rate against prevailing public borrowing costs, since the widest fiscal risk-transfer gaps identified in this review — in the UK and Italian cases specifically — trace to financing costs that were locked in at inception and not revisited as market conditions changed [8,6]. Quality and access indicators linked to payment adjustments should be specified with enough granularity, and monitored with enough independence from both contracting parties, to allow the kind of quality comparison that the Portuguese and Spanish studies reviewed here were able to conduct only retrospectively and with incomplete data [11,15]. Finally, corporate governance and public accountability arrangements for the private consortium should be designed from the outset to produce accountability-grade reporting rather than relying on private-sector decision-useful financial statements that were not designed to answer public value-for-money and risk-transfer questions [19].

This analysis has several limitations inherent to a comparative narrative synthesis rather than a systematic review with pooled quantitative estimates. The country coverage, while spanning several of the most extensively documented hospital PPP markets, is not exhaustive and likely under-represents Sub-Saharan African, South Asian, and Latin American hospital PPP experience, where the peer-reviewed comparative literature remains considerably thinner than for Europe and Australia. The quantitative findings drawn from individual studies — cost ratios, efficiency scores, and quality indicators — are heterogeneous in method, population, and time period, and are reported here as illustrative of documented directional patterns rather than as comparable point estimates suitable for meta-analytic pooling. Finally, because several of the schemes discussed (notably the ongoing reversion and renegotiation of Spanish concessions, and the relatively young Turkish city-hospital programme) remain in active policy flux, conclusions drawn from currently published evaluations may be superseded as longer-run outcome data become available.

Conclusion

Public-private partnerships for hospital infrastructure development do not admit a single verdict of success or failure; the comparative evidence assembled here shows that performance depends substantially on which of two structurally distinct contractual families is used — facilities-only DBFO/DBFM concessions or full clinical-and-facilities capitation concessions — and on how well each family's specific risk-allocation logic is matched, monitored, and periodically re-benchmarked against the technical, demand, and financing uncertainty actually present in a given health system. Construction-phase cost and schedule performance under hospital PPPs compares favorably with conventional public procurement in several of the best-documented national samples, but this advantage has in multiple cases eroded over the life of the contract as embedded financing costs and demand-risk exposures that were underestimated or mispriced at inception have compounded. Quality-of-care evidence remains more limited and more equivocal than the polarized policy debate suggests, with the most rigorous comparative studies finding modest and domain-specific rather than systematic differences between PPP and publicly managed hospitals. Future comparative policy research would benefit most from longer-run, whole-of-contract fiscal evaluations conducted independently of the contracting parties, and from quality and access data specified and monitored with sufficient granularity, at the point of contract design, to allow the kind of retrospective comparative analysis this review has had to reconstruct after the fact.

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