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From policy to practice: Rolling out the clinical nurse specialist role in Portugal

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ABSTRACT

The specialization of Health Human Resources (HHR) is increasingly recognized as essential for addressing evolving healthcare demands. This paper presents a comprehensive policy framework for assisting with the implementation of Clinical Nurse Specialist (CNS) roles at the national or regional level, integrating key dimensions including barriers and enablers, regulation and governance, education and training requirements, career development, workforce planning, and economic analysis. The framework was applied to the implementation of CNS roles in Portugal, resulting in the issuance of a decree-law by the government.

Our findings demonstrate that the economic analysis step was critical in addressing concerns from government authorities and health system funders regarding the potential budgetary impact of CNS implementation. By providing evidence-based projections of costs and benefits, the economic analysis facilitated smoother negotiations and consensus-building among stakeholders, including nursing unions. Furthermore, the integration of workforce planning ensured the alignment of educational capacity with workforce needs, thus avoiding potential implementation bottlenecks.

The application of the framework also revealed important feedback relationships between its dimensions, highlighting the interdependent nature of the implementation process. This dynamic approach, which adapts to real-time feedback and stakeholder input, underscores the necessity of a holistic and iterative strategy for successful CNS role integration. The insights gained from the Portuguese case underscore the utility of this policy framework in guiding the implementation of advanced nursing roles in diverse healthcare contexts.

1. Background

The specialization of Health Human Resources (HHR) addresses ongoing societal challenges. An OECD study highlights that increasing access to healthcare, improving quality of care, and adapting to changing patient needs justify the focus on nursing specialization. Additional drivers include a shortage of doctors, reduced waiting times, unmet care needs, and support for the underprivileged [1]. From a job perspective, enhancing the profession's appeal and career prospects also motivates upskilling [2].

Investing in human capital spurs economic growth and social well-being [3]. In healthcare, such investment fosters economies of scale and knowledge, and improves both the productivity of HHR and the quality of the healthcare delivered [4]. Nursing specialization, particularly for Nurse Practitioners (NPs) and Clinical Nurse Specialists (CNSs), improves healthcare accessibility, quality, and sustainability. NPs extend their scope of practice, with some task-shifting from physicians to nurses, while CNSs focus on delivering high-quality care within a specialized nursing area [5].

This paper aims to guide policymakers and health planners in implementing the CNS role at the national or regional level. Existing work focuses on organizational-level implementation [6–8] or focus on NPs [9]. We address the topic from a system-wide perspective, considering social, economic and political dimensions. The proposed framework has been successfully applied in Portugal, leading to a government decree-law and revealing crucial interconnections between these dimensions [10].

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2. Methods

We followed a three-step approach: first, we conducted a scoping literature review to gather evidence on the impact of CNSs across countries and health systems [11]. Next, we performed an international comparison, applying lesson-drawing [12] to gauge how different jurisdictions recognize, regulate and govern the CNS role, as well as educational, practice and certification requirements. Lastly, we engaged with stakeholders to understand the perspective policymakers need to consider [13]. This process led to the creation of a conceptual policy framework, which was then used to discuss and implement the CNS role in Portugal. The practical application of the framework and the encounter with real policymaking helped to refine it and revealed connections between the various steps.

2.1. Literature scoping review

We reviewed scientific articles from the last 30 years through searches on PubMed and other databases (Medline, CINAHL and Cochrane library) through EBSCO, using terms related to nursing specialization and implementation. Keywords, exclusion and inclusion criteria can be found in the research design shown in Fig. 1.

The literature review was synthesized to assess the impact of CNSs have on patients and population, workforce, and healthcare providers. This step is key for motivating policymakers to implement the role and address potential barriers [14]. We also identified key themes frequently mentioned in the literature employing thematic analysis [15,16].

2.2. International comparison

The second step involved an international comparison of regulation and requirements, focusing on role designation, regulation levels (if

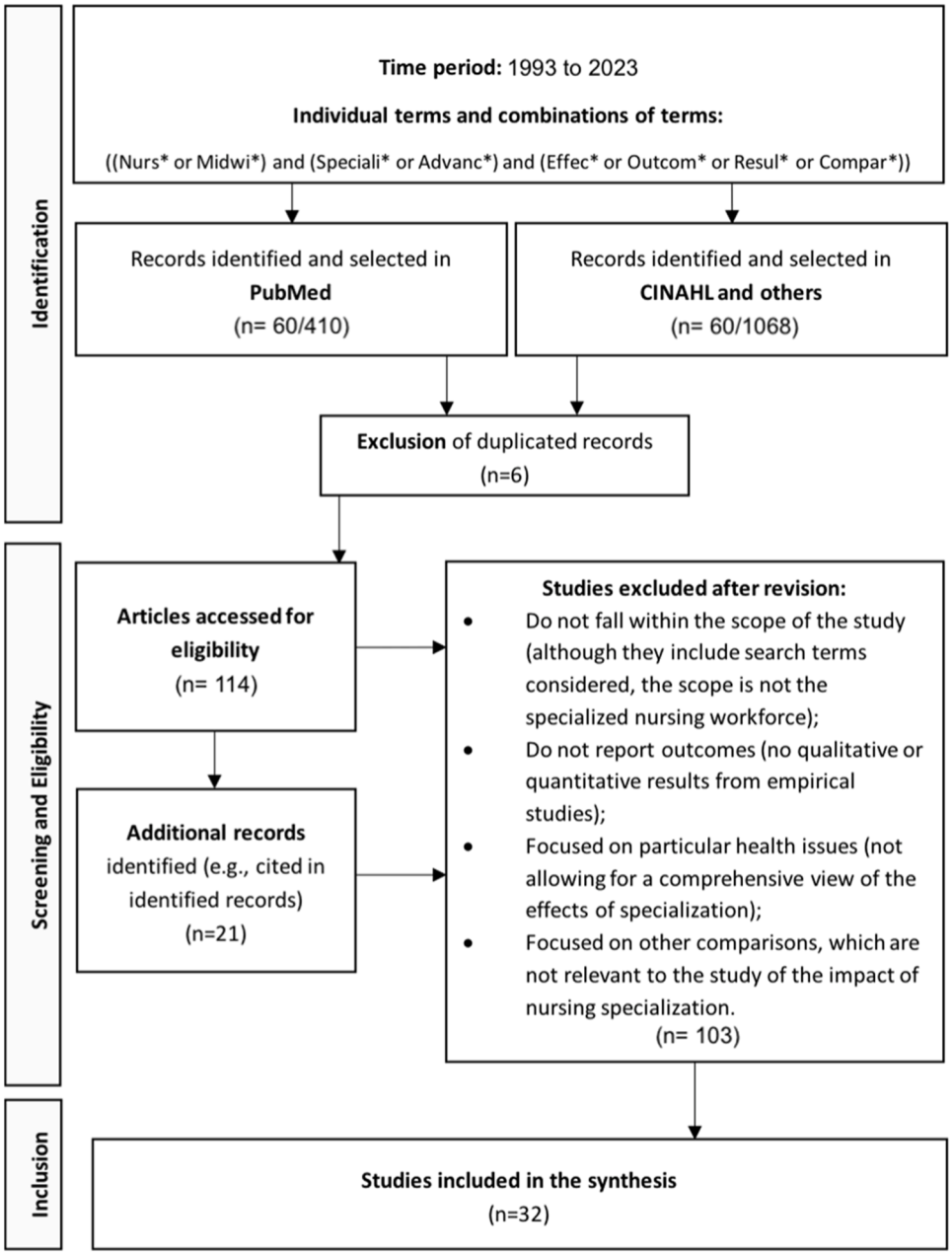


Fig. 1. Study selection process.

any), required education, the ability of CNSs to practice autonomously, and whether certification exists. This comparative analysis helps policymakers explore different options, establish benchmarks, perform lesson-drawing, and identify key policy questions, particularly concerning regulations, governance, education and training, and organizational change [12].

2.3. Stakeholder engagement

The third step involved engaging with relevant stakeholders to gather their expertise and concerns. We conducted unstructured interviews and open-ended conversations with nursing professionals, policy makers and the Order of Nurses [17]. This engagement is crucial for identifying key concerns that need to be addressed for successful implementation and for understanding the nuances of the health system [13].

3. Results

3.1. Literature review and international comparison

The findings summarized in Table A.1 (Supplementary material) show significant improvement in many performance indicators for all stakeholders, including patients and population, workers and labour market, and healthcare providers, supporting the implementation of the CNS role. This evidence is useful in reassuring stakeholders, especially health system funders, during the policy discussions. Countries like Australia, Canada, Finland, Netherlands, Ireland, New Zealand, and the United Kingdom have been recruiting nurses with specialized training for decades, particularly in primary care [18]. Canada and the USA introduced the CNS role in the 1960s to provide primary care in rural areas with low physician density [18], while the UK implemented it in the 1970s to improve healthcare access [18]. Finland has a long-standing tradition of collaboration between physicians and specialized nurses in multidisciplinary teams, particularly in healthcare centers. In contracts, countries like Belgium, France, Japan, Poland or Czechia only recently begun implementing these roles [19]. For a detailed international overview, see Table A.2 in Supplementary material.

3.2. A policy framework for implementing the CNS role

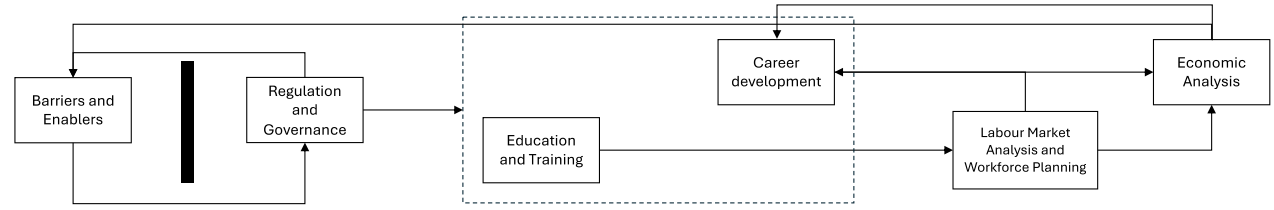
A thematic analysis of both the literature review and stakeholders interactions identified six critical steps for successful implementation [16], expanding on those suggested in a framework for NPs [9]. These include: i) barriers and enablers [20–23]; ii) regulation and governance [24,25,18]; iii) education and training requirements [26–28]; iv) career development [29–31]; v) workforce planning [25,32]; and vi) economic analysis [29,33].

For each step, we outline subactivities, relevant stakeholders, necessary inputs, methods and approaches, and outputs that serve as inputs for other steps or for stakeholder engagement. Fig. 2 provides a detailed overview of the framework, and how these elements interconnect.

Certain steps are particularly important to specific stakeholders, such as career development for nurses and nursing unions, while others, like economic and budgetary impact, are key for policymakers and government funding sources. Overall, the framework is primarily directed at regulatory bodies, nursing professional associations, health authorities, and policymakers.

3.2.1. Step 1: barriers and enablers

A successful CNS role implementation requires leveraging enablers, mitigating barriers, and engaging key stakeholders such as nursing and physician associations (especially if the scope of practice extends beyond traditional nursing), nurses and nursing unions, health authorities and policymakers [34]. Key enablers for nurses include addressing patient needs, fostering professional accomplishment, and offering career progression [20]. Organizational enablers include a political vision and support from unions and professional associations [20], as well as



Sub activities					
Stakeholder identification Environmental scanning International benchmarking Literature review	Stakeholder consultation Legal and regulatory review Scope of practice definition Regulatory drafting	Curriculum review Curriculum needs assessment	Current pay structure analysis Wage differential analysis Stakeholder negotiation	Data collection Forecasting Gap analysis Skill mix analysis	Cost identification Benefit quantification Budgetary impact analysis
Inputs					
Stakeholder feedback Existing policies and regulations Cultural and social norms Political environment	Legal frameworks Professional standards International benchmarks	Educational standards in nursing Curriculum frameworks Accreditation requirements Workforce competency needs Training resources	*Economic analysis* Current wage structures Health financing models Union agreements Funding availability	Workforce data Demand projections Migration patterns Retirement trends Training and graduation rates	Costs *Compensation structure* Benefits Budgetary constraints *Workforce forecasts*
Methods and approaches					
Survey research Delphi methods Focus groups Systematic review (e.g. PRISMA)	Legal review Policy analysis Regulatory impact assessment	Curriculum design Competency mapping Benchmarking Gap analysis	Comparative analysis Scenario planning Negotiation	Simulation Agent-based modelling System dynamics	Cost-benefit analysis Cost-effectiveness analysis Sensitivity analysis
Outputs					
Stakeholder analysis report Stakeholder engagement strategy Literature review Risk mitigation plan	Revised scope of practice document Regulatory policy brief Legislative drafts Governance framework	Curriculum development plan Competency framework Faculty development plan Training resource plan	Compensation structure proposal Career development plan Collective bargaining agreements Implementation guidelines	Workforce forecasts Gap analysis report HHR development strategy Scenario planning report	Cost-benefit analysis report Budget impact assessment Financial sustainability plan Economic impact brief
Stakeholders					
Nursing associations Physician associations Nurses and nursing unions Health authorities Policymakers	Regulatory bodies Health authorities Legal experts Nursing associations Healthcare providers	Nursing regulatory body Educational institutions Accreditation agencies	Nurses and nursing unions Healthcare providers Health authorities	Health planners Health authorities	Government Health authorities Nursing unions Healthcare providers Policymakers and advisors

Cross-cutting stakeholders: patients, patient advocacy groups and health policy experts

Fig. 2. Conceptual framework for rolling out the CNS role at a system's level.

positive empirical evidence of the impact of CNSs on organizational and health outcomes [35].

Overcoming barriers such as inter-professional resistance and outdated regulation is crucial [18,19,21], highlighting the importance of coordination with regulatory and governance efforts in Step 2. In fact, a lack of understanding of the CNS role can lead to confusion and underutilization within healthcare systems. Therefore, clear communication and education about the CNS role are essential to facilitate acceptance and effective collaboration among relevant stakeholders, especially those who may constitute a barrier.

Frictions arising from the autoregulation of the profession, as well as salary negotiations and degree requirements, can also hinder the implementation of advanced nursing roles, as the French case demonstrates [36]. In France, the introduction of advanced roles faced significant challenges due to strict legislative and regulatory frameworks that restricted the autonomy of nursing professionals. These barriers often delayed recognition and limited the scope of practice. Salary negotiations also emerged as a sensitive issue, as financial incentives for advanced roles were insufficient to attract and retain qualified candidates. Additionally, reforms to nursing education highlighted the complexities of aligning educational standards with professional practice, especially when institutional and regulatory structures were not fully prepared for such transitions [36,37].

3.2.2. Step 2: regulation and governance

Many countries lack basic nursing regulations, rules, or governance mechanisms, particularly for nursing roles with expanded scope of practice [38]. In some cases, existing regulations act as barriers [39], while in others, they drive advanced nursing practice [19,40]. Although frameworks for strengthening regulations exist, they often focus on the nursing workforce in general [41] or on ANPs/NPs [18] specifically, rather than CNS roles.

Therefore, legislative and regulatory changes are necessary to establish well-defined CNS roles [18,19]. First, it is important to assess the benefits of regulation versus non-regulation [18]. Different governance models exist, with the most common being state-based and profession-based regulations [42]. For setting the scope of practice, three regulatory approaches are used: i) national-level regulation; ii) decentralized or devolved regulation; and iii) no regulation (left at the provider's discretion) [18]. Additionally, identifying other governance measures is essential to ensure quality and to enable the CNS workforce to fully utilize its educational qualifications [18].

Regulators should act as catalysts for advancing nursing roles and should minimize variations in specialized training and practice [43]. While decentralized regulation with multiple levels of regulation is common, separate regulations are not required [44,45]. Minimum harmonization of decentralized regulation is also recommended [18]. Engaging regulatory bodies, health authorities and nursing associations is critical during consultations, legal and regulatory reviews, scope of practice definition and regulatory drafting.

3.2.3. Step 3: education and training

CNSs typically hold an MSc degree, though in some cases only a bachelor's degree or a bachelor's degree with a post-graduation is required (cf. Table A.1). Universities and educational providers generally have the flexibility to design academic training curricula, but it is recommended to harmonize educational and practice-level requirements to reduce variability and ensure quality [18]. In some countries, clinical practice is also mandatory, with evidence showing it enhances health outcomes [19]. International guidelines emphasize the importance of advancing education through an MSc or post-graduate program [26,28].

Nursing regulatory bodies, educational institutions, and accreditation agencies should collaborate on curriculum reviews and needs assessment. This collaboration should lead to the development of a curriculum plan, a competency framework, a training resource plan and a faculty development plan that suits the specific educational setting, considering the significant variations in the duration and depth of bachelor's and master's degree programs across countries.

3.2.4. Step 4: career development

CNS implementation depends on a proper career development strategy that caters to the RN needs and motivations, therefore requiring proper pay and hiring policies, as well as work positions [46]. A career progression pathway and hiring policy should be established to encourage RNs to pursue further training. Payment policies should value the expanded competencies acquired by CNS, recognizing their training efforts and patient care responsibilities [45,46]. Organizational incentives, such as financial penalties for not employing nurse specialists can also help nurse specialists work at their full potential [47]. Unions must be involved in negotiations over wage premiums and career development plans, as in US CNSs earn on average 55 % more than RNs [48,49]. In fact, that's what RNs expect when enrolling in additional training [50]. In this phase it is fundamental to involve nurses and nursing unions, healthcare providers and health system funders in the discussions.

3.2.5. Step 5: labour market analysis and workforce planning

The main challenge regarding HHR policies consists of planning a healthcare workforce that fits the needs of the population, which implies building a workforce that is able to deliver the right care to the right people, in the right place, at the right time [32,51]. As part of this task, the skill-mix that best satisfies these needs has to be defined, which requires estimating the adequate ratio of CNSs/RNs to satisfy pending needs [52].

Thus, forecasting the evolution of nursing professionals is paramount [32]. These forecasts will not only help to determine the specialist vacancies that should be opened and the number of nurse specialists that should be hired in order to achieve the ratios RNs/population and CNSs/RNs deemed reasonable [53], but also help with informing discussions between stakeholders.

3.2.6. Step 6: economic analysis

The empirical studies evaluating the impact of having CNSs among the nursing workforce show positive effects on both the quality of care provided [54,55] and in promoting access to health care [56,57]. However, costs also arise from the training and maintenance of a specialized nursing workforce, which requires quantification to appease health system funders.

Both direct costs of the training process as well as indirect and opportunity costs that have to be borne during and after the training of these health workers should be considered. Moreover, the increased wages resulting from a more qualified workforce, the salary differentials for CNSs, and the financial incentives for RNs to pursue specialization must also be considered [22]. Three main costs widely mentioned in the literature must then be accounted for [14,22,58,59]: the opportunity cost of nurse unavailability, the opportunity cost of supervision, and the cost associated with the wage increase. The first is the cost resulting from the absence of the nurse from the job, and the second is the cost related to the absence of the supervisor. All these costs can be easily computed through publicly accessible data in most countries.

As for benefits, and despite the large number of publications pointing to significant gains from specialization [55,60–63], the calculation of how health gains translate to economic benefits is complex. First, measuring and quantifying these benefits raises challenges on its own: many of the health outcomes positively affected by specialization are difficult to measure [64]. In addition, indicators such as health status, access, quality of services provided or patient satisfaction are not directly or easily measurable in monetary terms [65].

Thus, a large part of the literature reports only the monetary gains (or savings) resulting from the decreased use of some healthcare services [56,66,67]. For instance, reductions in the number of hospitalizations

and length of stay between 20 % and 30 % were reported [62,68] and can be used to estimate the benefits, although they underestimate significantly the potential gains, since they're mostly focused on secondary care settings such as hospitals.

3.3. Framework instantiation to a real-life setting

The application of the framework to a real-life setting is used to illustrate how it can be put in practice, but it was also key for uncovering the feedback loops that exist between steps. The starting point is identifying the dynamics and particularities of the health system. Portugal has a tax-funded, command-and-control, Beveridgian health system. Regulation, financing and provision are primarily secured by the State, with the professional associations in charge of their own regulation with regards to deontological and ethical guidelines, as well as clinical [53,69].

Although the specialties existed and RNs could enroll in post-graduation studies to become specialists, there was no regulation recognizing the role or defining the scope of practice within the Portuguese National Health System (SNS), in practice rendering the additional qualifications and the professional title useless.

Key stakeholders were involved in the process: nurses and nursing unions, nursing professional association (Order of Nurses), governmental representatives and health authorities. In addition, researchers and health policy experts also participated the process.

Barriers and enablers. The Order of Nurses and nursing unions, two key stakeholders, viewed this as an opportunity to improve nursing care and negotiate better wages and career progression plans. These stakeholders were important drivers of change. By explaining that no task-shifting from physicians to nurses would occur, the physician's association did not raise any objections, removing potential barriers. Finally, the Ministry of Health showed openness provided it did not affect the financial sustainability of public accounts. All these stakeholders were deeply involved in the negotiations, and the economic analysis and projections produced as part of this work were critical in moving forward.

Regulation and governance. There were no regulations clarifying the role's recognition, defining the scope of practice, or setting the requirements for education, training, and recruitment. The nursing profession is autoregulated in Portugal, so it was the professional's association responsibility to define the access criteria and the extended scope of practice for each nursing specialty, as well as the educational requirements in articulation with high education institutions and accreditation agencies.

Education and training. Prior to the changes enacted, there were six nursing specialties recognized by law, namely:

(i) community care; (ii) perioperative care; (iii) rehabilitation; (iv) pediatric care; (v) maternal care; and (vi) mental health. As part of the implementation plan, the nursing association requested the legal recognition of four other specialties: (i) palliative care; (ii) critical care; (iii) chronic care; and (iv) family health, totaling ten. The plan established requires prior nursing experience of over 800 h of clinical time or, in alternative, a 30 ECTS post- graduation. Next, the RN enters a residency that includes 9 months of supervised clinical practice (15 months in the case of Maternal Health). In parallel, the nurse can pursue a master's degree, although this is non-compulsory. Upon the successful completion of the residency, the RN is awarded the title of CNS (cf. Fig. 3).

Career development. Nursing unions were demanding a premium of 50 % over the base salary of a RN, in line with other countries [48,49]. However, the Portuguese government declined, fearing a significant financial impact, and proposed a e 150 top-up instead (<10 % increase). Such a low premium over the standard wage has lower budgetary impact, as our budgetary impact analysis shows, but it may not provide enough incentives for RNs to undergo additional studies, which come at a personal cost. The economic analysis was key to reach a consensus between the stakeholders.

Workforce planning. An agent-based simulation model was adapted and calibrated with data provided by the health authorities [70]. Access to residency is conditioned by a maximum of 3000 places per year, which takes into consideration the survey done to nursing schools to assess available capacity. If evenly distributed by the ten specialties, 300 places per specialty are available. This value is not binding, it only limits the number of nurses who can start residency each year and may be subject to changes in the future. The residency vacancies can be further adjusted to achieve Safe Nurse Staffing levels [71].

Regarding the number of positions for CNSs to be opened in the NHS, there are no *a priori* guidelines for fixing them, as it depends on the budgetary capacity, political willingness, bargaining power, etc. Different scenarios were assessed to evaluate the financial impact. The simulations considered 1000, 1500, or 2000 positions per year, which all accommodate the budgetary concerns arising from the Ministry of Finance, which is also a key stakeholder governing the Portuguese NHS, but left some leeway for political negotiation and bargaining. By the end of the planning horizon (2032), it is expected to have 15,000, 22,500 and 30,000 CNSs hired, depending on the number of positions opened.

Economic impact. For estimating the budgetary impact, the gross average base remuneration of a non-specialist nurse (e 1232) was used, as well as the wage premium of €150 negotiated with the government and included in the compensation package. Nursing unions were initially demanding €600 (in line with some international evidence [48,49]), and the budgetary forecasts were key to unlock the negotiations between stakeholders.

On average, the yearly cost of the residency was estimated at 38.4 million Euros, for an average of 2200 residents per year. These estimations were made assuming 10 % of the time of the RN supervisor will be

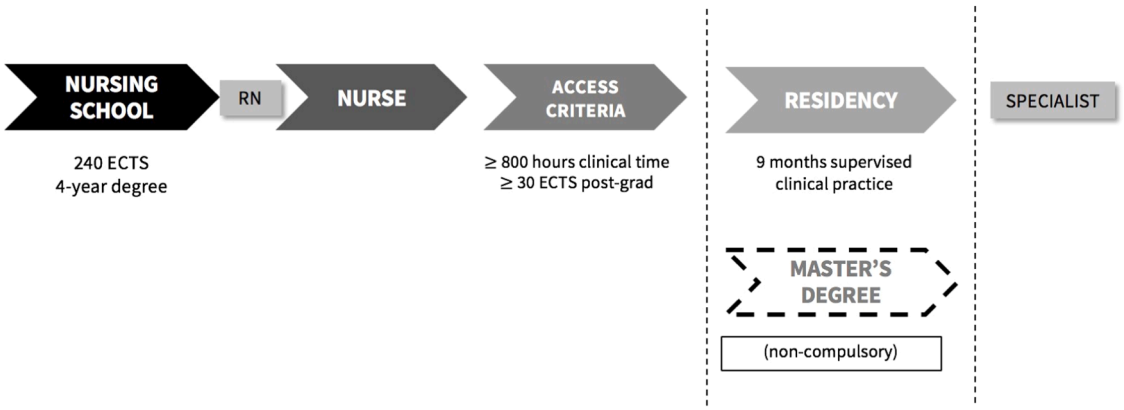


Fig. 3. Training and education pathway proposed by the Order of Nurses.

dedicated to each RN resident and that the nurse's dedication to residency was 50 % (two more cases were considered to perform a sensitivity analysis, 30 % and 100 %).

The costs arising from the increase in salary for nurse specialists depend directly on the number of nurse specialist positions to open each year. Considering 1000, 1500 and 2000 positions/year, the increase in expenditures on salaries is respectively 31.5, 47.3, and 63 million Euros. These values correspond to 15,000, 22,500 and 30,000 nurses hired as specialists in the public sector at the end of the planning horizon (2032).

For the benefits only the monetary gains resulting from a decrease in hospitalizations were considered, which is a very conservative estimate. The base rate for a hospitalization episode is €2285 and the historical annual number of discharges is 819,476, amounting to an average cost of 1 870 million Euros. The baseline scenario considered was a reduction of 5 % in the number of hospitalization episodes. Under this scenario, the total savings amount to 91.5 million Euros by the end of the projection horizon. Note that the impact of incorporating CNSs only comes into full effect by 2032, since CNSs are still being trained and incorporated in the workforce.

Adding up the estimated costs and benefits returns the expected net effect of the implementation of CNSs. As Fig. 4 illustrates, the initial period represents a burden to the government's budget, since the expected benefits take time to take effect, but this trend is reversed later.

4. Discussion

The implementation of Clinical Nurse Specialist (CNS) roles in healthcare systems is a complex process that requires a carefully structured approach. The policy framework devised in this paper, which includes six critical steps—barriers and enablers, regulation and governance, education and training requirements, career development, workforce planning, and economic analysis—provides a comprehensive guide for policymakers aiming to integrate CNS roles effectively. This framework is designed to be adaptable to different country settings, offering guidance on the methods and stakeholders involved at each stage of implementation.

A significant finding from applying this framework in a real-life setting was the uncovering of feedback relationships between the different steps of the framework. These relationships highlight the interdependency of the various dimensions and the importance of considering them in a holistic manner.

For instance, the economic analysis step played a crucial role in addressing concerns from government authorities and health system funders, particularly the Ministry of Finance, who were apprehensive about the potential budgetary impact of implementing CNS roles. By conducting a thorough economic analysis, it was possible to provide evidence-based projections of costs and benefits, which helped to alleviate these fears and move the implementation process forward [72]. This step not only served to mitigate financial concerns but also reinforced the importance of integrating economic considerations early in the planning process to avoid potential barriers later on.

Similarly, the economic analysis was instrumental in facilitating negotiations with nursing unions and other stakeholders regarding wage demands during the career development phase. Understanding the economic impact of these demands allowed for more informed discussions and quicker consensus among stakeholders. This example underscores how economic analysis can serve as a bridge between different stakeholder groups, fostering a common understanding and enabling smoother decision-making processes [73].

In another example, labour market analysis through workforce planning emerged as a critical dimension for reaching agreements on the number of residency vacancies. Effective workforce planning ensured that there was a clear understanding of the demand for CNSs and the capacity of the education system to produce qualified professionals [32]. Aligning workforce needs with educational capacity ensured that the healthcare system could absorb newly trained specialists without creating oversupply or bottlenecks, which was valuable for unions and policy makers.

A comparison with France highlights key differences in implementation and how they hamper the process [36]. In France, when the CNS role was introduced in the 1990s, there were no salary negotiations or financial recognition, creating a major barrier to its integration. Additionally, opposition from medical unions, who feared losing their professional monopoly, hindered progress. Until 2019, there was no remuneration for CNS positions, which significantly affected their attractiveness. Furthermore, from 2010 to 2016, two French universities offered master's programs dedicated to CNS training, but the absence of regulation and legislation created confusion. APNs who completed these master's degrees often found themselves in workplaces unprepared to accommodate their advanced skills, leading to frustration and underutilization of their expertise. Political changes further complicated negotiations, making the process difficult. By contrast, Portugal's case benefited from early salary discussions, which facilitated stakeholder engagement and eased the implementation process, demonstrating that financial incentives and structured workforce planning are crucial factors in the successful integration of CNS roles.

The Portuguese case underscores that successful CNS role implementation requires a flexible and integrated approach. Each step of the framework influences and is influenced by the others, reinforcing the need for continuous monitoring and stakeholder engagement. For

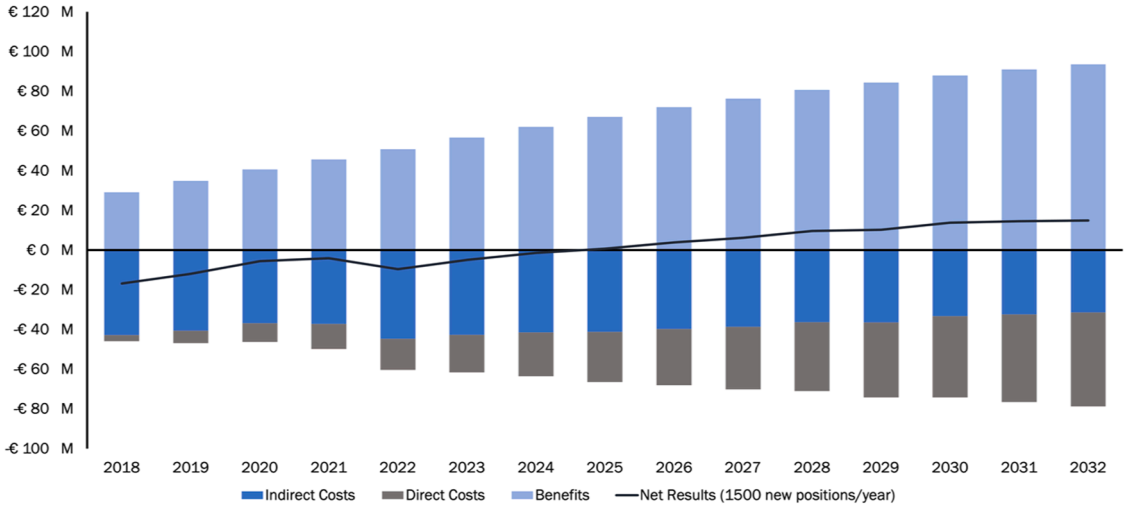


Fig. 4. Cost-benefit baseline analysis of implementing CNS in Portugal.

international policymakers, this case study illustrates the importance of engaging with all stakeholders, performing economic foresight, and doing cross-sector collaboration in healthcare workforce planning. The lessons learned from Portugal provide a roadmap for other nations seeking to enhance their nursing workforce and optimize the impact of CNS roles within their healthcare systems.

5. Conclusion

The application of the proposed policy framework to the implementation of CNS roles in Portugal has revealed important interdependencies between the various dimensions of the framework. By addressing these relationships proactively, policymakers can better manage the challenges associated with CNS implementation, leading to more effective and sustainable outcomes. This experience underscores the importance of a comprehensive, adaptable framework that can guide the implementation process in diverse healthcare contexts, ensuring that all relevant factors are considered, that potential barriers are addressed in a timely manner, and that relevant stakeholders participate and are engaged in the process.

CRediT authorship contribution statement

Mário Amorim-Lopes: Writing – review & editing, Writing – original draft, Validation, Project administration, Methodology, Investigation, Funding acquisition, Data curation, Conceptualization. **Sofia Cruz-Gomes:** Writing – original draft, Visualization, Validation, Software, Resources, Methodology, Investigation, Conceptualization. **Elisa Doldi:** Writing – review & editing, Software, Data curation. **Bernardo Almada-Lobo:** Supervision, Project administration, Methodology, Funding acquisition, Formal analysis, Conceptualization.

Declaration of competing interest

This work derived from a technical report requested by the Portuguese Nurses Association in order to conduct a systematic literature review and an international review. However, the involvement of the Portuguese Nurses Association did not condition or determine the work developed, neither in the definition of the methodology nor in the selection of any content. The research abided by the strictest scientific norms and guidelines.

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Supplementary materials

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