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Transformative learning in clinical reasoning: a meta-synthesis in undergraduate primary care medical education

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ABSTRACT

Clinical reasoning is a vital medical education skill, yet its nuances in undergraduate primary care settings remain debated. This systematic review explores clinical reasoning teaching and learning intricacies within primary care. We redefine clinical reasoning as dynamically assimilating and prioritising synthesised patient, significant other, or healthcare professional information for diagnoses or non-diagnoses. This focused meta-synthesis applies transformative learning theory to primary care clinical reasoning education. A comprehensive analysis of 29 selected studies encompassing various designs made insights into clinical reasoning learning dimensions visible. Primary care placements in varying duration and settings foster diverse instructional methods like bedside teaching, clinical consultations, simulated clinics, virtual case libraries, and more. This review highlights the interplay between disease-oriented and patient-centred orientations in clinical reasoning learning. Transformative learning theory provides an innovative lens, revealing stages of initiation, persistence, time and space, and competence and confidence in students' clinical reasoning evolution. Clinical teachers guide this transformation, adopting roles as fortifiers, connoisseurs, mediators, and monitors. Patient engagement spans passive to active involvement, co-constructing clinical reasoning. The review underscores theoretical underpinnings' significance in shaping clinical reasoning pedagogy, advocating broader diversity. Intentional student guidance amid primary care complexities is vital. Utilising transformative learning, interventions bridging cognitive boundaries enhance meaningful clinical reasoning learning experiences. This study contributes insights for refining pedagogy, encouraging diverse research, and fostering holistic clinical reasoning development.

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Introduction

Within the realm of medical education, the concept of clinical reasoning learning has frequently been depicted as an enigmatic internal process occurring within students' minds. Nevertheless, achieving consensus on a precise definition of clinical reasoning in this context has remained a subject of fervent debate, leading to a proliferation of varied interpretations [1,2]. An intrinsic challenge in establishing a standardised definition has arisen from the diverse manifestations of clinical reasoning teaching and learning across distinct clinical settings [3,4]. Of noteworthy concern is the disproportionately strong emphasis on evidence originating from classroom-based clinical reasoning education, eclipsing the significance of its workplace-based counterpart [3].

Against this backdrop, our study is meticulously tailored to illuminate the intricacies embedded within clinical reasoning teaching and learning situated within the primary care landscape of workplace-based settings. Central to our endeavour is the aspiration to unravel the multifaceted dimensions inherent in clinical reasoning learning that unfold within primary care environments. Anchoring this exploration is our operational definition of clinical reasoning, which encapsulates a dynamic process involving the accumulation and prioritisation of relevant, amalgamated information sourced from patients, their vital connections, or fellow healthcare professionals. This unfolding process is firmly situated within the unique contours of the primary care setting, where the

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pertinent information can take on diverse forms – spanning historical narratives, physical markers, or outcomes emanating from diagnostic investigations. These trajectories culminate in outcomes that encompass both the pivotal realm of diagnostic conclusions and the equally consequential domain of non-diagnosis. Inextricably linked to these clinical reasoning endeavours is their profound objective: to guide informed decision-making in symbiotic partnership with patients and to delineate a trajectory for their continued care.

In the primary care setting, clinical reasoning takes on a distinct character due to the nature of patient encounters, the diversity of conditions encountered, and the emphasis on continuity of care [5]. Understanding the unique aspects of clinical reasoning in primary care is essential for educators, practitioners, and policymakers to optimise teaching and learning strategies in this context.

In primary care, healthcare providers often serve as the first point of contact for patients seeking medical care, and they are responsible for managing a wide range of health issues, including both acute and chronic conditions [6]. This comprehensive scope of care necessitates a broader and more holistic approach to clinical reasoning. Furthermore, primary care settings are characterised by continuity of care, with providers having the opportunity to develop long-term relationships with their patients. This longitudinal aspect allows primary care providers to consider patients' social, cultural, and psychological contexts, as well as their values and preferences, when making clinical decisions. Primary care providers also play a crucial role in preventive care, health promotion, and managing patients' overall well-being. In the primary care setting, clinical reasoning takes on a distinct character due to the nature of patient encounters, the diversity of conditions encountered, and the emphasis on continuity of care. Understanding the unique aspects of clinical reasoning in primary care is essential for educators, practitioners and policymakers to optimise teaching and learning strategies in this context.

In contrast, other healthcare settings may have a more focused approach to clinical reasoning, with a narrower scope of practice and a greater emphasis on specialised diagnostic tests and procedures. Outpatient or ambulatory care settings, for example, may primarily focus on addressing specific conditions or providing specialised treatments, which could influence the clinical reasoning process.

The paramount importance of systematically reviewing clinical reasoning teaching and learning in undergraduate primary care medical education rests on

several critical grounds. First and foremost, primary care occupies a central and enduring role in healthcare delivery, demanding a deep comprehension of clinical reasoning unique to this setting. A comprehensive examination of the educational strategies employed to foster clinical reasoning competencies within primary care is indispensable. Moreover, given the distinctiveness of primary care settings' emphasis on holistic, patient-centred care, the nuances of clinical reasoning within this context necessitate thorough exploration. By systematically synthesising the current knowledge in this domain, our study endeavours to enrich the pedagogical landscape by uncovering innovative approaches, identifying challenges, and offering valuable insights for refining clinical reasoning education within primary care.

To guide our exploration, we have formulated the following review questions:

- (1) How do primary care educators facilitate transformative learning experiences to enhance clinical reasoning skills?
- (2) What roles do patients play in the teaching and learning of clinical reasoning in primary care?
- (3) What are the facilitators and barriers to transformative learning in primary care, specifically related to clinical reasoning?
- (4) What practical implications can be derived from transformative learning theory for teaching clinical reasoning in primary care?

Methods

Study design and focus

This study rigorously follows a systematic review approach focusing on clinical reasoning teaching and learning within undergraduate primary care medical education. In response to the reviewer's guidance, our methodology centres on a meta-synthesis framework [7] that uniquely explores clinical reasoning education through the lens of transformative learning theory [8], thus ensuring a clear and consistent approach throughout the paper.

Inclusion criteria and paper selection

In alignment with our refined focus, we have meticulously selected studies that explicitly address clinical reasoning teaching and learning within the primary care context. The review now exclusively encompasses studies directly pertinent to our

purpose, ensuring precision and relevance in our analysis.

Collaborative review process

The review process involves a collaborative approach to enhance rigour and ensure a comprehensive analysis. Two authors independently reviewed and analysed each included paper at every synthesis level, fostering an iterative process of interpretation and consensus-building. Discrepancies were resolved through deliberations to maintain a coherent interpretation of the data.

Three-level synthesis framework

Our synthesis framework, as guided by the reviewer's suggestions, comprises three distinct levels, each contributing to our overarching goal:

Narrative description of findings

At the first level, we provide a narrative description of findings extracted from the selected papers. This narrative serves as a foundation for subsequent analyses, outlining the landscape of clinical reasoning teaching and learning within undergraduate primary care medical education.

Thematic analysis and transformative learning

The second level focuses on thematic analysis [8], underpinned by transformative learning theory. We

systematically identify recurring themes that emerge from the selected studies, capturing how clinical reasoning is nurtured and developed within primary care education. By framing our exploration within transformative learning theory, we gain a deeper understanding of the underlying mechanisms that drive clinical reasoning pedagogy in this unique context.

Deductive mapping and implications

The third level involves a deductive mapping of the identified themes within the transformative learning framework. This mapping facilitates the identification of facilitators and barriers to transformative learning, offering valuable insights into the practical implications of our findings for enhancing clinical reasoning education within undergraduate primary care medical settings.

Result

Included studies and demographics

Our systematic review encompasses a total of 29 studies distributed across various research methodologies, including 10 qualitative, 12 quantitative, and 7 mixed-method designs (Figure 1). The geographical scope of the studies is widespread, with contributions from diverse locations such as Australia ($n = 5$), Germany ($n = 1$), Hong Kong SAR ($n = 1$), Indonesia ($n = 1$), Japan ($n = 1$), Nepal ($n = 1$), Taiwan & UK ($n = 1$),

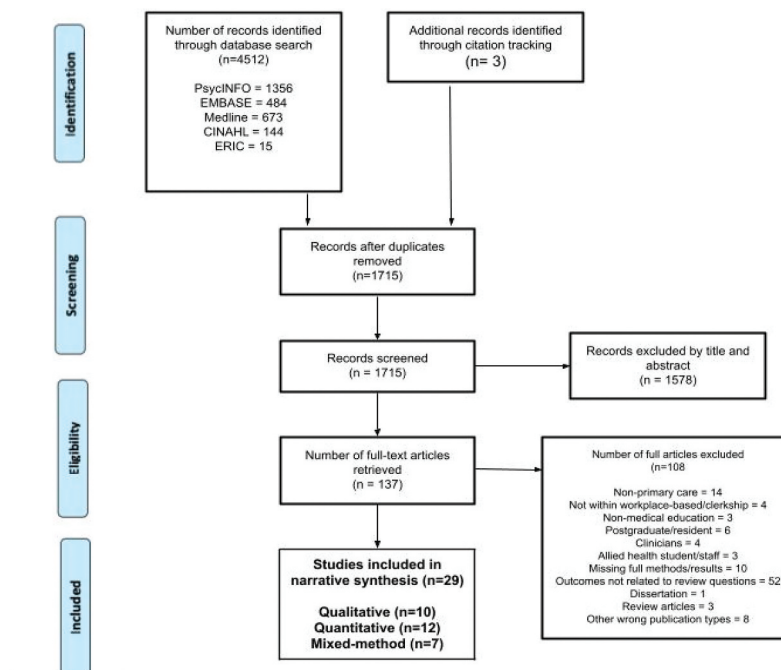


Figure 1. PRISMA diagram.

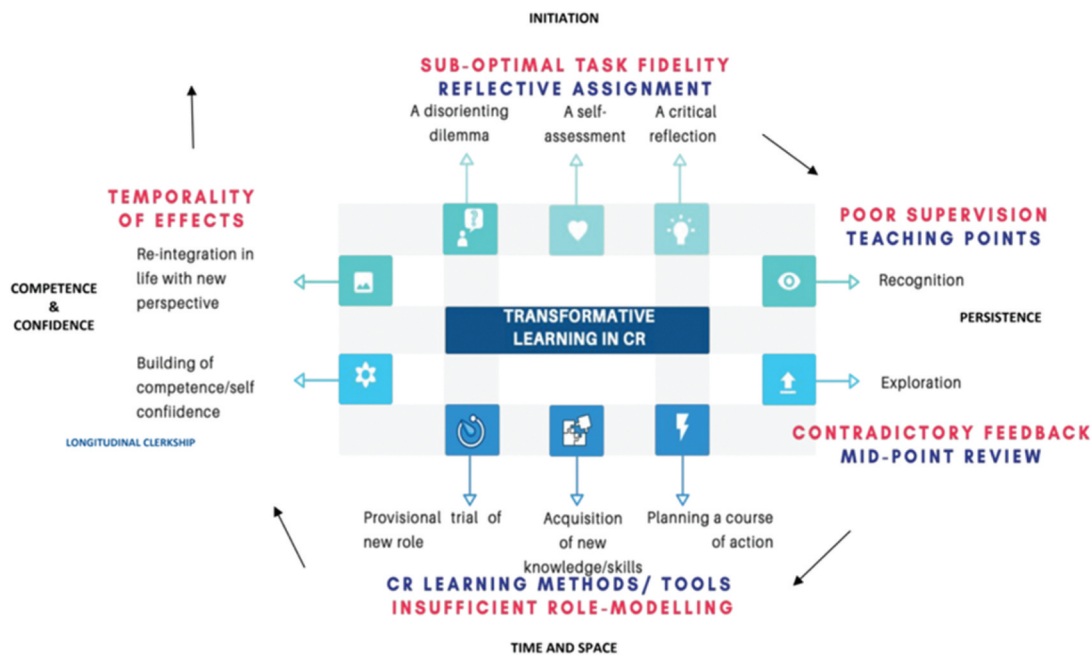


Figure 2. Transformative learning steps, facilitators, and barriers in clinical reasoning teaching and learning.

Saudi Arabia ($n = 2$), Sweden ($n = 1$), United Arab Emirates ($n = 1$), the United Kingdom & Eire ($n = 4$), and the United States of America ($n = 10$). Refer to Table 1 for an overview of the studies included, outlining the geographical distribution and methodological diversity of the studies.

Clinical reasoning teaching and learning activities

Our analysis underscores the integral role of primary care clinical placements in fostering clinical reasoning skills among medical students. These placements are characterised by various durations, encompassing early clinical experience (ECE) opportunities, short-term placements spanning one week, and extended terms spanning multiple years. Notably, urban and rural contexts have been instrumental in shaping clinical reasoning pedagogy [3,9–16].

The range of clinical reasoning teaching and learning modalities within primary care settings is diverse. Bedside teaching, clinical consultations, simulated GP clinics/consultations, virtual case libraries, clinical problem-based learning (PBL), disability modules, and inter-professional education have emerged as effective avenues for nurturing clinical reasoning [10–27]. Importantly, cognitive frameworks such as illness script development workshops and SNAPPS (Summarise history and findings; Narrow differentials; Analyse differentials; Probe preceptor about uncertainties; Plan management; Select case-related issues for self-study)

have emerged as instrumental tools in advancing clinical reasoning skills [26,28].

Theoretical underpinnings in clinical reasoning education

In the field of educational sciences, the term ‘theory’ refers to a set of principles, concepts, or frameworks that are systematically developed to explain and understand various aspects of teaching, learning, and educational phenomena.

Our analysis made visible two central categories of theories that underpin clinical reasoning teaching and learning within undergraduate primary care education. The first category revolves around models of patient care, which are either oriented towards disease-focused approaches or patient-centred approaches. Notably, studies orientated towards diagnosing cases using clinical reasoning, teaching, and learning, showcase an alignment with disease-oriented patient care models. On the other hand, patient-centred orientation emerges in studies that actively involve patients in teaching/learning interactions, focusing on patient participation and engagement in clinical reasoning activities [9,10,15–19,29].

Under the umbrella of learning theories, our analysis reveals connections to constructs such as constructivism, experientialism, and socio-cultural theories. These theories manifest through diverse approaches such as computer-assisted learning, telemedicine, self-directed learning, problem-based learning, experiential

learning, and engagement with rural or community-based medicine concepts. Remarkably, clinical reasoning theories, including the hypothetico-deductive model, exemplary theory, and metacognitive processes, further enrich the landscape of theoretical underpinnings in clinical reasoning education [11,12,14,19–34].

The hypothetico-deductive model and illness scripts are models or frameworks that describe how clinicians generate and test hypotheses during the process of clinical reasoning. They are not learning theories per se, but they are relevant to understanding clinical reasoning in medical education. Additionally, teaching methods such as problem-based learning (PBL), simulation, and computer-assisted learning can be used to facilitate the development of clinical reasoning skills. While these methods are not learning theories themselves, they can be informed by learning theories and provide effective instructional approaches for promoting clinical reasoning abilities.

Facilitators and barriers in clinical reasoning training

The analysis reveals that the context, nature of assignments, and community of clinical encounters intricately influence clinical reasoning, teaching and learning. In the context of the clinical encounter, various factors emerge as facilitators or barriers. These factors include the authenticity of clinical experience, students' perceptions of primary care settings, and the quality of care provided. While authentic clinical experiences and distinctions between primary care and hospital settings facilitate clinical reasoning learning, challenges include the translation of reasoning between settings and variations in the standard of care [9,11,12,16–18,27,29,30,34–38].

The nature of assignments during clinical encounters plays a pivotal role in shaping students' clinical reasoning learning experiences. Positive perceptions, interactive discussions, immediate feedback, and teaching-focused activities are facilitative, while inadequate repetitions or task fidelity, such as tasks being too easy or too difficult, hinder clinical reasoning learning [20–22,27,31,36].

The community of clinical encounters, encompassing interactions with clinical teachers and patients, further influences clinical reasoning education. Clinical teachers adopt diverse roles such as fortifiers, connoisseurs, mediators, and monitors, all contributing to students' clinical reasoning development [10,11,14,18,24–26,28,30,35,36]. Patients also assume significant roles, transitioning from passive to active involvement, from self-focused to teaching-focused participation, and influencing the transformative learning process [9,12,15–18,25,29,35,36].

Transformative learning in clinical reasoning training

While no single study fully embodied the transformative learning cycle, elements from each of its ten stages were discernible across included studies. Our analysis identified key themes corresponding to the transformative learning stages of initiation, persistence, space and time, and competence and confidence (Figure 2). Notably, reflective assignments facilitated the initiation stage, emphasising the importance of task design. Persistence, an essential facet for learners, was supported through teaching points and midpoint reviews. Facilitators like clinical reasoning learning tools, illness script development, and longitudinal primary care clerkships contributed to the space and time theme. The theme of competence and confidence underscored the impact of primary care clerkship in nurturing transformative learning, though the temporality of transformative effects was acknowledged [9,11,12,14,16–18,20–22,24–30,34–36].

Throughout our analysis, the profound influence of transformative learning in clinical reasoning education emerges as a unifying theme. Transformative learning theory offers a robust framework for understanding the multifaceted dynamics that shape clinical reasoning teaching and learning in primary care. By mapping our findings against the transformative learning cycle, we shed light on the intricate interplay of facilitators and barriers that influence students' transformative journey towards enhanced clinical reasoning competence [9,11,12,14,16–18,20–22,24–30,34–36].

Discussion

Distinct contributions and contextual significance

Our systematic review is a distinctive contribution by adopting a comprehensive approach to study selection, allowing us to delve into the nuanced realm of clinical reasoning learning and teaching within primary care. In consonance with earlier findings, this review supports the notion that clinical reasoning is an inherently socially situated endeavour [33]. Moreover, it underscores the notion that generic clinical activities, often encompassed within the umbrella of clinical reasoning, have been acknowledged previously [4]. Notably, clinical reasoning, as a socially constructed phenomenon, demands medical students to assimilate contextual factors such as socioeconomic, cultural, and demographic attributes into their medical judgements and decisions [39–41]. The integration of patient-oriented and disease-oriented approaches within primary care settings signifies a harmonious coexistence of these facets within the fabric of workplace-based practice.

Transformative learning as a bridging lens

Our review underscores the pivotal role of transformative learning theory in bridging the chasm between the contextual and abstract dimensions of clinical reasoning learning. Transformative learning theory, originally proposed by Jack Mezirow, emphasises the importance of critical reflection and the reconstruction of knowledge and beliefs as learners engage in experiences that challenge their existing perspectives. By applying transformative learning theory to the study of clinical reasoning in primary care, we can gain valuable insights into how learners develop their reasoning abilities and how educators can effectively foster transformative learning experiences.

The initiation of transformative learning is catalysed by external triggers, sparking a dilemma that necessitates interactions with peers, clinical teachers, or patients for the progression of transformational stages [42]. Various factors, including learning tasks, clinical teachers, patients, and contextual nuances, can serve as triggers for this transformative process. Crucially, post-dilemma discussions, particularly with clinical teachers, serve as anchors for the sustained transformation of mindset, behaviours, and attitudes, ultimately fostering the integration of new beliefs and actions into learners' cognitive fabric.

Dynamic roles of clinical teachers

Within the clinical reasoning pedagogical landscape, clinical teachers emerge as dynamic entities, encompassing a spectrum of roles that influence students' clinical reasoning development. From executive roles like mediating with students and patients to participate in learning activities to more deliberate functions such as role-modelling clinical reasoning during consultations, clinical teachers wield significant impact [10,14,18,25,28,35,36,43–46]. The explicit articulation of clinical reasoning processes is vital, as these processes, though often conceptualised as internal cognitive events, necessitate verbalisation or written expression to enhance students' understanding of clinicians' thought processes and decision-making rationale [47,48]. The deliberate facilitation of clinical reasoning learning, including the design of clinical teaching, assumes paramount importance, as intentional instruction has been demonstrated to substantially augment students' clinical reasoning proficiency [43].

Patient-centred nexus of clinical reasoning

As vital partners, patients occupy a central position in clinical reasoning, teaching, learning, and interactions. Varied forms of patient involvement, ranging from passive to active engagement, accentuate the pivotal role of

social mediation in clinical reasoning pedagogy. The spectrum of patient involvement encompasses interactions with actual and simulated patients, reflecting a continuum from self-focused interactions to teaching-focused engagements [9,12,15–18,25,29,35,36]. This patient-oriented dimension holds profound implications, as it underscores the intricate interconnectedness between individual and external factors shaping their health trajectory – a cornerstone for effective clinical reasoning [49].

Practical implications for clinical educators

The evidence from our review holds profound implications for medical educators, especially clinical teachers, who are urged to transcend cognitive boundaries and proactively explore clinical reasoning within a holistic spectrum. Empowering clinical teachers with training on role-modelling clinical reasoning and cultivating skills in other pivotal aspects of clinical placements holds the potential to fortify pedagogical efficacy. decision-making strategies, and the reasoning behind clinical judgements helps students understand the cognitive steps involved in clinical reasoning. It enables them to observe and learn from experienced practitioners as they navigate through complex clinical scenarios. Explicitly sharing thought processes, decision-making strategies, and the reasoning behind clinical judgements helps students understand the cognitive steps involved in clinical reasoning [41]. It enables them to observe and learn from experienced practitioners as they navigate through complex clinical scenarios. By encouraging tutors to reflect on their own thinking and articulate it to students, they can bridge the gap between their swift Type I thinking and the slower, more deliberate Type II thinking that underlies clinical reasoning. This explicit approach not only enhances students' understanding of clinical reasoning but also promotes metacognition and reflective practice, which are vital for developing robust clinical reasoning skills. Transformative learning principles can guide clinical educators in fostering students' awareness of the intricate contextual influences on reasoning, thus facilitating their transition from passive learners to active participants in clinical reasoning knowledge creation [9,11,12,14,16–18,20–22,24–30,34–36].

Patient-centred collaborations

Patients' active participation in clinical reasoning pedagogy warrants strategic efforts to align teaching and learning opportunities with their willingness to contribute to knowledge co-creation. Offering simple pre-

interaction guidance and articulating the role of patient input in shaping clinical reasoning can harness patients' valuable insights in the educational process [9,12,15–18,25,29,35,36].

Integration of theoretical underpinnings

Our analysis highlights the critical role of theoretical frameworks in shaping clinical reasoning teaching and learning. Disease-oriented and patient-centred models of care, intertwined with diverse learning theories, orchestrate a comprehensive approach that embraces the holistic nature of primary care. While this review portrays a snapshot of the theoretical landscape, the dependence on positivist theories prevalent in hospital-based clinical reasoning literature underscores the need for a broader theoretical spectrum tailored to the primary care context. Thus, advocating for research encompassing a richer array of theoretical underpinnings and contextual exploration within primary care is vital [11,12,14,19–34].

Strengths and limitations

The strength of our systematic review is rooted in adopting a meta-synthesis approach, enabling a holistic exploration of clinical reasoning pedagogy beyond mere efficacy assessment. Rigorous inclusion procedures, coupled with data extraction cross-checks, ensure robustness. By unveiling the intricate layers of clinical reasoning teaching and learning, we reconcile complexities while retaining focus on granular details.

Nonetheless, categorisation complexities and definitional disparities within clinical reasoning might lead to the inadvertent exclusion of relevant articles. Geographical limitations and linguistic biases towards English publications underscore the need for broader representation. Exclusion of thesis dissertations and conference proceedings may overlook pioneering insights. Our review sets the stage for future studies to embrace transformative learning and explore the diverse facets of clinical reasoning teaching and learning within primary care contexts, transitioning from individual cognitive learning to collaborative interactions.

Conclusions

In conclusion, our systematic review illuminated the intricate landscape of clinical reasoning teaching and learning within the primary care milieu. By employing a comprehensive study selection approach, we ventured beyond the conventional boundaries, shedding light on the multifaceted dimensions of clinical

reasoning within this context. The synthesis of findings corroborates prior research, highlighting clinical reasoning as an inherently social construct. Moreover, it accentuates the presence of generic clinical activities camouflaged as clinical reasoning. Notably, our review positions transformative learning theory as a pivotal lens bridging the gap between abstract cognitive processes and contextual nuances. This theory operates as a catalyst, transforming external triggers into transformative dilemmas, eventually integrating new cognitive frameworks into learners' cognitive repertoire. This transformative journey is sustained through discussions with peers, clinical mentors, and patients, each playing a distinct role in facilitating this cognitive evolution.

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