

Managing Uncertainty in Infectious Diseases at the General Practice Level

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Uncertainty is the feeling of leaving behind what is organized, stable, and known, and of facing an uncertain and threatening future. It is a constant in humanity and in all living beings. Uncertainty is inherent in healthcare, as it is in all aspects of complex behaviors whose outcomes are not linear. Tolerance for uncertainty is a necessary skill for providing effective healthcare (mitigating medical risk, optimizing healthcare system costs, and preventing professional burnout) [1].

The COVID-19 pandemic and the subsequent situation have amply illustrated the role of uncertainty in healthcare [2, 3]. At what age should we begin protecting the population? At 60 or 70 years old? How can we reduce the inequalities exposed by COVID-19? What are some of the clinical effects of loneliness and social isolation? Was lockdown the right political choice?, etc. [4].

This is because COVID-19 is a complex problem within a complex system (multiple interacting components, fluid and difficult-to-define boundaries, dynamic evolution, unpredictability, and adaptive responses to interventions). Complex systems can only be properly understood in their entirety; uncertainty, tension, and paradox are inherent and must be embraced rather than resolved.

Instead of seeking certainty, we should be open to uncertainty and acknowledge the limitations of the imperfect data we have no choice but to use [5].

Thus, some simple rules for managing uncertainty in a pandemic would be:

- Most data will be flawed or incomplete;
- For some questions, certainty may never be reached. Carefully consider whether to wait for definitive evidence or act on the evidence you have;
- Different people (and different stakeholder groups) interpret data differently;
- Pragmatic interventions, carefully observed and compared in real-world settings, can generate useful data to complement the findings of controlled trials and other forms of evidence
- But, while medical uncertainty is a widespread and significant problem in both hospital and primary care, uncertainty is more intense in general practice due to the biopsychosocial approach [6]. And this affects not only exceptional situations like a pandemic, but every case of infectious disease.

In secondary care, uncertainty is seen as something that must be eliminated at all costs, and consequently, absolute certainty is sought; This model focuses on strict protocols and seeks exhaustive (sometimes unnecessary) diagnostic tests to eradicate any doubt. In family medicine, uncertainty is accepted: it is considered an inherent part of medicine, not a personal failure.

Uncertainty must be acknowledged, reflected upon, and strategically managed, and lessons learned from mistakes rather than concealed. The sense of "clinical mastery" is associated with the ability to manage uncertainty in clinical practice. In general medicine, classifying problems as "simple" or "complex" is merely a conventional classification: all problems are always highly complex, and their classification depends on where we arbitrarily stop our investigation [7, 8].

While a specialist in a hospital setting treats pre-screened patients with advanced testing, the family physician encounters symptoms in their most primitive, chaotic, and undifferentiated state. Primary care consultations present unique dynamics that amplify clinical uncertainty: 1) Prevalence of undifferentiated symptoms: Patients present within the first 24-48 hours of the onset of infection. At this stage, a self-limiting viral infection, the onset of sepsis, or a severe bacterial infection can all present with the same symptoms (fever, malaise, and headache); 2) Bayes' theorem and low prevalence: In the community, the prior probability that a common symptom (such as a cough) is due to a serious condition (such as atypical pneumonia or tuberculosis) is extremely low. This reduces the predictive value of traditional physical examination. 3) Pressure on care and limited time: General practitioners must make complex decisions in just a few minutes, reducing the time available to observe the natural progression of the illness before making a judgment; 4) Restricted access to technology: Unlike hospitals, family physicians do not have immediate access to urgent microbiology laboratories or advanced imaging techniques, relying heavily on their clinical judgment and limited rapid diagnostic tests.

In general practice, uncertainty is not considered a failure of knowledge, but rather an intrinsic characteristic of the job. General practitioners act as a buffer for the healthcare system: if they attempted to eliminate 100% of the uncertainty by ordering additional tests for every case of fever, they would overwhelm radiology and laboratory services, as well as cause unnecessary harm to patients through overdiagnosis. Therefore, family physicians require superior psychological and technical competence to safely manage risk through effective safety nets.

In general practice, managing clinical uncertainty in the face of emerging pathogens, viral resurgences, and antimicrobial resistance is addressed through a strategic combination of rapid diagnostic technologies, patient communication, wait-and-see approaches, and clinical safety networks [9-13].

In addition to evidence-based medicine (EBM), several partially overlapping approaches have been identified that are more frequently used than EBM as a sole tool by GPs to deal with complexities.

These approaches are specific to GPs and are not used (or very rarely) by hospitalists. Managing uncertainty in family medicine relies primarily on qualitative skills. Thus, the tools for addressing this uncertainty in the actual practice of general medicine have their own characteristics: 1) the doctor-patient care relationship; 2) continuity of care; and 3) context (family, community) [14-20]. In this context, as mentioned before, several diagnostic and clinical strategies for managing uncertainty in infectious diseases, typical of general medicine, can be cited:

Point-of-care testing

Systematically implement rapid molecular, antigen, and biomarker tests (such as PCR or procalcitonin) during the same consultation to guide initial prescribing and immediately rule out serious etiologies [21-23].

Watchful waiting

Defer the definitive diagnostic decision in cases of mild or ambiguous clinical presentations. This avoids overdiagnosis and allows the natural course of the disease to reveal clear pathognomonic symptoms [9, 11, 18, 22]. The value of continuity of care plays a crucial role here, a concept deeply rooted in general medicine, which has been shown to produce numerous benefits, such as reduced mortality and greater patient satisfaction [24-27].

Delayed antibiotic prescribing

Dispense antimicrobial prescriptions under the strict condition that they be used only if symptoms worsen after a specific number of days. This measure is key to combating increasing antimicrobial resistance [28].

Comparativa Del Ecosistema De Incertidumbre

Factor clínico	Medicina General (Atención Primaria)	Especialidad Hospitalaria (Urgencias / Infectología)
Fase de la enfermedad	Inicial, temprana y biológicamente cambiante.	Avanzada, establecida o con signos de gravedad claros.
Presentación del cuadro	Indiferenciada (síntomas vagos y comunes).	Diferenciada (con analíticas previas y sospecha dirigida).
Herramientas de manejo	El tiempo (espera expectante) y la comunicación.	Tecnología médica, monitorización continua y aislamiento.
Objetivo principal	Descartar organicidad grave y evitar la iatrogenia.	Confirmar el patógeno exacto y optimizar la terapia dirigida.
Consecuencia del error	Sobrediagnóstico o retraso en derivación crítica.	Toxicidad farmacológica o prolongación de estancia hospitalaria.

Use of Living Guidelines

Consult dynamic protocols that are updated digitally in near real-time to respond scientifically to immune escape variants or evolving epidemiological alerts [13, 29].

Communication and relationship with the patient

The clinical interview allows us to identify what the patient thinks about their condition, what specific fears they harbor, and what they expect to receive during the consultation [9]. It is also the setting for a transparent explanation of the uncertainty: Openly admitting to the patient that the exact diagnosis is not yet clear. Explaining the clinical probabilities and the logical steps that will be followed in a simple way. And finally, shared decision-making: Actively involving the person in choosing the care pathway (for example, choosing between having a blood test immediately or waiting 48 hours at home). This reduces anxiety for both parties [30].

Safety Netting

The safety net is the fundamental preventive tool in the face of diagnostic uncertainty in primary care [12]. This includes specifying warning signs: Clearly indicating to the patient what constitutes serious worsening symptoms (e.g., dyspnea, refractory fever, non-blanchable rashes); Define the contact channel:

Detail with pinpoint precision where to go if complications arise (telephone consultation, primary care emergency room, or hospital emergency room); and Set time limits for evolution: Establish exact time windows for spontaneous resolution of the condition and schedule brief proactive check-ups in cases of intermediate risk [18].

Professional support and mental health of the physician

This includes peer case discussions: Routinely organize brief meetings with the healthcare team or clinical review groups to compare decisions regarding complex infectious diseases. It also includes reflective practice and proper record-keeping: Maintain meticulous medical records that explicitly justify expectant management. Analyzing one's own feelings of discomfort in the face of uncertainty helps prevent emotional exhaustion [31- 33].

In summary, the high uncertainty in the management of infectious diseases in general medicine, from a pandemic (such as COVID-19), through epidemic diseases (or outbreaks) (for example, an outbreak of a new strain of respiratory virus or food poisoning), to common infectious diseases, many of which are endemic in a specific population or geographic region over time (for example, the common cold and pharyngitis, seasonal influenza, urinary tract infections, acute gastroenteritis, etc.), and in the face of emerging pathogens, viral resurgences, and antimicrobial resistance, can be managed based on the concepts specific to that level of care (doctor-patient care relationship; continuity of care; and context - family, community). These concepts are implemented in practice through a strategic combination of rapid diagnostic technologies, communication with the patient, wait-and-see approaches, and clinical safety networks.

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