

“FROM BIOLOGICAL POTENTIAL TO WISE CARE: EXPLORING GENETIC, EPIGENETIC, AND PROFESSIONAL INFLUENCES ON NURSING WISDOM”

Dr. Premalatha Ra. Janani Dheepak¹, Dr. Sathya Kohila Vani², Dr. Soumya J. C³, Dr. Nadiya Hussain Alsomali⁴, Dr. Nasra Hussain Alsomali⁵, Azhar Ali Mohammed Alazhary⁶

¹Shift Manager (NNINA) & Quality Improvement Specialist, Riyadh, Kingdom of Saudi Arabia.

²Principal, RIMS – Faculty of Nursing, Krishnagiri, Tamil Nadu, South India.

³Associate Professor, J.C. Cooperative College of Nursing, Trivandrum, Kerala, South India.

^{4,5}Advanced Practice Registered Nurses (APRNs), King Fahad Medical City, Riyadh, KSA.

⁶Unit Manager, National Neuroscience Institute Nursing Administration, King Fahad Medical City, Riyadh, KSA

*Corresponding Author: Dr. Premalatha Ra. Janani Dheepak, E-mail: premjaya76@gmail.com

Orcid ID: <https://orcid.org/0009-0002-3570-7826>

ABSTRACT

Background: Nursing wisdom extends beyond knowledge acquisition and accumulated clinical experience. It involves the ability to interpret complex situations, integrate clinical and ethical considerations, exercise sound judgment, and provide individualized compassionate care. This article does not propose that wisdom is genetically determined or that a specific “wisdom gene” exists. Rather, biological characteristics may contribute to empathic potential, while professional nursing wisdom develops through the interaction of biological, educational, experiential, relational, reflective, and environmental influences.

Aim: This article examines how biological characteristics interact with education, clinical experience, interpersonal relationships, reflection, professional development, and practice environments in the development of nursing wisdom.

Discussion: Genetic and epigenetic research provides emerging insights into biological influences on empathy and social responsiveness. However, these findings should not be interpreted as evidence that nursing wisdom is biologically predetermined. Biological characteristics may contribute to individual differences in empathic potential, whereas education, clinical experience, mentorship, relationships, reflective practice, and environmental conditions shape how these capacities develop and are expressed in nursing practice. Nursing wisdom therefore emerges as a multidimensional and evolving professional capacity that integrates knowledge, empathy, reflection, ethical awareness, clinical judgment, and purposeful action.

Conclusion: Nursing wisdom is best understood as an evolving professional capacity rather than a fixed biological trait. Although biological and genetic factors may contribute to empathic potential, wisdom develops through the continuing interaction of learning, experience, reflection, relationships, professional development, and practice context. This perspective highlights how nurses progress from biological potential and acquired knowledge toward compassionate judgment and wise clinical action.

KEYWORDS: *nursing wisdom; empathy; compassion; genetics; epigenetics; OXTR; oxytocin; clinical judgment; professional development; compassionate care*

INTRODUCTION

Nursing wisdom represents the capacity to respond appropriately to complex clinical situations by integrating professional knowledge, practical experience, contextual understanding, ethical awareness, and compassionate judgment. It becomes evident when nurses move beyond applying established procedures and are able to recognize what is important in a particular situation, consider the needs and perspectives of the individual patient, and determine an appropriate course of action. Wisdom in nursing is therefore expressed through the quality of professional judgment and the appropriateness of action rather than through knowledge or experience alone.

Empathy is an important component of this process because it enables nurses to recognize and understand patients’ perspectives, emotions, and experiences. Contemporary evidence suggests that empathic functioning develops through the interplay of biological predispositions and environmental influences rather than through a single determining factor (Abramson et al., 2020). Genetic studies have further indicated that individual differences in empathy involve multiple genetic influences, supporting a complex rather than single-gene explanation (Warrier et al., 2018).

Epigenetic research offers an additional perspective on the relationship between biological characteristics and experience. Epigenetic mechanisms can influence gene activity without altering the underlying DNA sequence and may be responsive to environmental and experiential conditions. Processes such as DNA methylation, histone modification, and non-coding RNA regulation provide potential pathways through which biological characteristics and lived experiences may interact. Findings involving the oxytocin system, including OXT- and

OXTR-related regulation, have generated interest in understanding individual differences in empathic responses (Spencer et al., 2022).

However, biological influences on empathy should not be equated with biological determination of professional nursing wisdom. The central proposition of this article is that biology may contribute to empathic potential, whereas nursing wisdom develops through the continuing interaction of education, clinical experience, professional relationships, mentorship, reflection, ethical development, and the practice environment. In other words, biological characteristics may provide part of the potential for empathic responsiveness, but professional development shapes how that potential is expressed in nursing practice. This perspective positions nursing wisdom as an evolving professional capacity rather than a fixed biological characteristic.

1. Nursing Wisdom in Contemporary Nursing Practice

Nursing wisdom becomes particularly relevant when clinical situations involve uncertainty, competing priorities, individual differences, or circumstances that cannot be adequately addressed through standardized procedures alone. Wise practice requires nurses to interpret available information within its context, identify clinical and ethical considerations, recognize the patient's individual needs, and determine an appropriate response. Reflection, emotional awareness, moral sensitivity, humility, and practical judgment contribute to this process (Matney et al., 2020; Mendivil-Pérez et al., 2025; Cosmai et al., 2026).

The concept of wisdom-in-action emphasizes that wise decision-making is shaped by the interaction between the practitioner and the circumstances in which care occurs (Matney et al., 2020). From this perspective, nursing wisdom cannot be reduced to years of practice or the amount of knowledge acquired. Rather, it is demonstrated through the ability to recognize the significance of a situation, integrate relevant knowledge and experience, and respond with judgment that is clinically appropriate, ethically sound, and responsive to the individual.

2. Biological and Genetic Influences on Empathy

Empathy is a multidimensional characteristic shaped by the interaction of genetic and environmental influences. Evidence from twin studies indicates that inherited factors contribute to variation in both emotional and cognitive forms of empathy, while environmental experiences also play an important role in their development (Abramson et al., 2020). Genome-wide research has similarly suggested that empathy has a polygenic architecture, in which many genetic variants may contribute small effects rather than a single gene determining empathic characteristics (Warrier et al., 2018).

These findings support the possibility of biological contributions to empathic potential but do not establish that professional empathy, compassion, or nursing wisdom is genetically determined. The expression of empathy within nursing occurs within a professional and social context and is influenced by education, clinical learning, interpersonal relationships, professional values, experience, and organizational conditions. Genetic findings should therefore be viewed as one part of a broader developmental model rather than as an explanation for the emergence of nursing wisdom.

3. Oxytocin (OXT)–Oxytocin Receptor (OXTR) Pathway

The oxytocin system has received considerable attention in research examining social interaction, interpersonal responsiveness, emotional processing, and affiliative behavior. Oxytocin exerts many of its biological effects through the oxytocin receptor, encoded by the OXTR gene. Among the genetic variants investigated in this area, OXTR rs53576 has been examined for possible associations with empathy and related social characteristics (Gong et al., 2017).

Evidence concerning OXTR variation and empathy, however, has not been entirely consistent. Differences in populations, study designs, assessment methods, and contextual influences may contribute to variations in findings (Barchi-Ferreira & Osório, 2021). The OXT–OXTR pathway should therefore be regarded as a possible contributor to social and empathic functioning rather than as a biological explanation for empathy itself or, more broadly, for nursing wisdom.

4. Epigenetic Regulation: Connecting Biology and Experience

Epigenetics provides a useful conceptual framework for examining how biological characteristics and environmental experiences may interact. Epigenetic regulation can modify gene expression without altering the DNA sequence. Mechanisms such as DNA methylation, histone modification, and non-coding RNA activity may influence how genes respond to internal and external conditions.

Research involving the oxytocin system has reported relationships between OXT/OXTR-related methylation patterns and empathic responses (Spencer et al., 2022). Such findings are informative but should be interpreted with appropriate caution. An observed association between methylation and an empathic response does not demonstrate that the epigenetic change causes empathy, compassion, or wise behavior. Epigenetic mechanisms are therefore better understood as potential pathways linking biological characteristics with environmental and experiential influences than as evidence of biological determination.

5. From Empathy to Compassionate Nursing Care

Empathy and compassion are closely related but conceptually distinct. Empathy involves understanding another person's perspective or emotional experience, whereas compassion extends beyond understanding to include concern and a motivation to respond to suffering or need. In nursing practice, these qualities may be reflected through attentive communication, emotional presence, respect, responsiveness, and individualized care (Varghese & Khakha, 2025; Meiers et al., 2026).

Empathic understanding does not automatically result in appropriate compassionate action. Nurses must interpret the patient's experience alongside clinical information, professional responsibilities, ethical principles, and the practical circumstances of care. Compassionate practice therefore involves transforming understanding into an appropriate professional response. This transition from perception and understanding to purposeful action represents an important pathway through which empathic potential may contribute to the development of wise nursing practice.

6. Knowledge, Experience, Reflection, and Clinical Judgment

Although empathy is relevant to nursing wisdom, it represents only one component of a broader developmental process. Professional education provides the scientific, theoretical, and ethical foundations required for nursing practice, while clinical experience enables nurses to apply and refine this knowledge in diverse and often unpredictable situations. Reflection allows nurses to examine previous actions, recognize strengths and limitations, learn from outcomes, and modify future practice.

Reflective approaches have been associated with the development of clinical judgment among nurses (Kim et al., 2025). Equally important is awareness of cognitive and implicit biases, which may influence the interpretation of clinical information and subsequent decision-making when they remain unrecognized (Al-Moteri et al., 2020; Thirsk et al., 2022). Nursing wisdom can therefore be understood as an integrative capacity through which knowledge and experience are examined, interpreted, and applied appropriately within the circumstances of care (Matney et al., 2020; Cosmai et al., 2026).

7. Factors Contributing to the Development of Nursing Wisdom

The development of nursing wisdom is influenced by multiple interacting domains rather than by any single personal or biological characteristic. Biological factors may contribute to empathic potential, while education, clinical exposure, mentorship, professional relationships, reflective practice, and the work environment shape the development and expression of professional capacities. The contribution of each domain may vary across individuals and circumstances.

Education provides foundational knowledge and professional values; clinical experience develops practical understanding and situational awareness; and mentorship and professional relationships provide opportunities for guidance, feedback, and shared learning. Empathy and compassion support meaningful therapeutic relationships, while reflection enables nurses to derive learning from clinical experiences. Together, these influences may strengthen clinical judgment, ethical awareness, relational understanding, and context-sensitive decision-making (Kim et al., 2025; Cosmai et al., 2026).

Accordingly, nursing wisdom may be conceptualized as a progressive and integrated professional capacity. It develops over time as nurses continually connect knowledge with experience, reflection with learning, and empathic understanding with purposeful action. From this perspective, wise nursing practice represents neither a purely acquired skill nor a biologically predetermined characteristic. Rather, it emerges from the dynamic interaction of biological potential, professional development, lived experience, relationships, reflection, and the context in which nursing care is provided.

8. An Integrated Developmental Pathway to Nursing Wisdom

Nursing wisdom develops progressively throughout a nurse's professional journey through the interaction of education, clinical experience, reflection, professional relationships, empathy, compassion, and the practice environment. These influences work together as nurses encounter diverse patient needs, complex clinical situations, ethical challenges, and changing healthcare demands.

Education provides the foundation of professional knowledge, while clinical experience enables nurses to apply and refine this knowledge in real situations. Mentorship and professional relationships provide guidance and shared learning, while empathy and compassion support individualized and person-centered care. Reflection enables nurses to examine their experiences, identify learning, and improve future practice.

Through this continuing process, nurses may develop stronger clinical judgment, ethical awareness, emotional understanding, and context-sensitive decision-making. Nursing wisdom is therefore not a fixed attribute acquired at a particular stage of a career; it continues to evolve through learning, experience, reflection, and professional engagement.

9. From Learning to Wisdom: The Nursing Wisdom Tree

The Nursing Wisdom Tree illustrates the progressive development of professional nursing wisdom through the interaction of biological potential, education, clinical experience, relationships, mentorship, empathy, compassion, reflection, and the practice environment.

Roots-Reflective Practice: Reflection and learning from experience provide the foundation for continuous professional growth.

Trunk/Core-Nursing Wisdom: The trunk represents the emerging capacity to integrate knowledge, experience, reflection, empathy, ethical awareness, and professional judgment.

Branches- Developmental Dimensions: The branches represent biological potential, education, clinical experience, mentorship and relationships, empathy and compassion, and the practice environment.

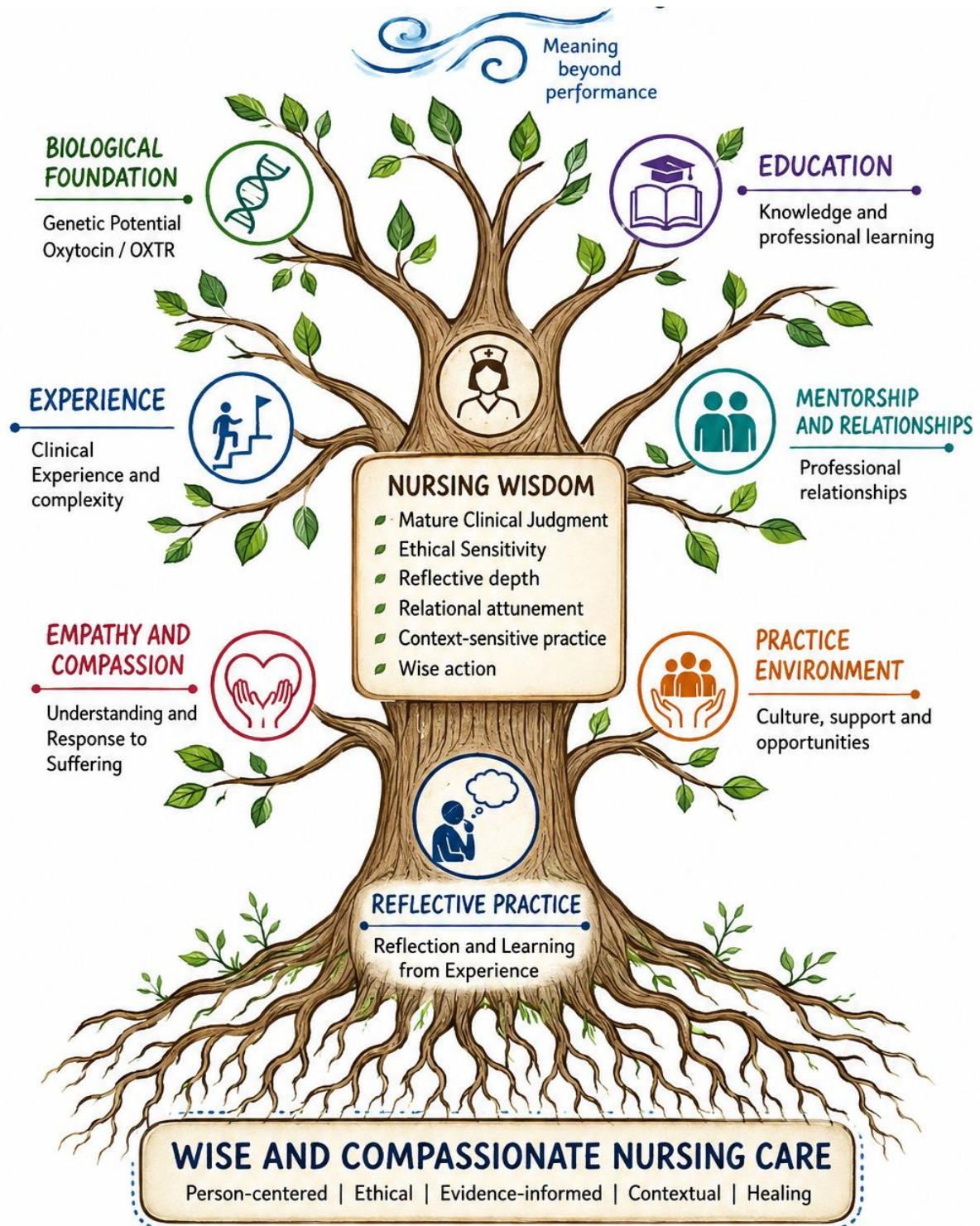
Leaves -Ongoing Growth: The leaves symbolize continuous learning, professional development, adaptation, and the expression of wisdom in practice.

Outcome- Wise and Compassionate Nursing Care: Nursing wisdom is expressed through person-centered, ethical, evidence-informed, context-sensitive, and compassionate care.

Top-Meaning Beyond Performance: The top represents the deeper meaning, purpose, and professional significance of nursing practice beyond routine performance.

Overall, the Nursing Wisdom Tree illustrates how biological potential may contribute to empathic capacity, while education, experience, relationships, reflection, and practice context shape its development into professional nursing wisdom and wise action. Knowledge provides the foundation, experience gives it depth, and reflection transforms experience into insight. Empathy connects the nurse with the patient, while compassion transforms understanding into meaningful action. Clinical judgment brings together what the nurse knows, perceives, feels, and understands within the moment of care. Through this continuous process of growth and integration, nurses move beyond performing care toward understanding its deeper meaning, purpose, and human significance.

The Development of Nursing Wisdom: A Tree Model



Advocacy Wisdom

Speaking up for patients, colleagues, safety, dignity, and professional standards.

Research and Administrative Wisdom	Using evidence, professional experience, critical thinking, and sound judgment to improve nursing practice and healthcare systems.
Self-Wisdom	Recognizing personal strengths and limitations, maintaining professional boundaries, seeking help when needed, and remaining committed to lifelong learning.

Together, these areas demonstrate that nursing wisdom extends across clinical practice, communication, teamwork, leadership, education, advocacy, research, administration, and decision-making.

Nature and Types of Nursing Wisdom

This figure illustrates nursing wisdom as a multidimensional capacity comprising clinical, ethical, practical, reflective, emotional, and relational wisdom. These forms of wisdom enable nurses to integrate knowledge and experience with reflection, empathy, ethical values, and clinical judgment to provide safe, compassionate, and context-sensitive care.

The nature of nursing wisdom in professional nursing practice.



The Evolution of Nursing Wisdom in Nursing Practice

Nursing wisdom integrates knowledge, experience, evidence, reflection, clinical judgment, ethics, leadership, and compassion across practice, education, research, and administration. In the future, nurses will increasingly integrate technology and artificial intelligence with human judgment, ethical decision-making, lifelong learning, leadership, and innovation to deliver wise, safe, and compassionate care.

Era	Wisdom in Nursing	Example
Ancient Care	Observation, experience, practical knowledge, comfort, and protection of the vulnerable	Traditional caregivers
Early Christian Era	Compassion, service, charity, and care for those in need	Phoebe (Early Christian Caregiver)
Crimean War	Courage, practical knowledge, observation, organization, and culturally responsive care	Mary Seacole (Pioneer Caregiver)
Nursing Reform	Hygiene, systematic observation, environmental care, evidence, documentation, and leadership	Florence Nightingale (Founder of Nursing)
Modern Nursing	Scientific knowledge, clinical judgment, evidence-based practice, ethics, communication, and professional responsibility	Contemporary Nursing Professionals
Today & Future	Integration of knowledge, experience, evidence, reflection, ethics, leadership, technology, artificial intelligence, innovation, and human judgment.	The Wisdom-Informed Nurse

Implications for Nursing Education and Practice

Viewing nursing wisdom as a developing capacity shaped by biological, psychological, and professional influences has important implications for nursing education and practice. Although empathy may have biological components, its professional expression can be influenced by education, clinical experiences, relationships, and the practice environment. Nursing education should therefore extend beyond knowledge acquisition by incorporating reflective practice, simulation, clinical reasoning, mentorship, emotional awareness, ethical reasoning, and compassionate communication. In clinical settings, supportive leadership, constructive feedback, mentorship, and structured debriefing may help nurses learn from experience and develop deeper clinical understanding and judgment. These approaches support the view that nursing wisdom is a capacity that can develop progressively through learning, experience, reflection, and professional practice (Matney et al., 2020; Kim et al., 2025; Cosmai et al., 2026).

Limitations and Cautions

The proposed connection between biological factors, empathy, compassion, and nursing wisdom should be interpreted cautiously. Current evidence does not identify a specific “wisdom gene” or “compassion gene,” and genetic associations with empathy do not demonstrate a direct causal relationship. Similarly, epigenetic research provides preliminary evidence of associations between gene regulation and empathic processes but does not establish that epigenetic changes directly produce compassion or nursing wisdom. Much of the available genetic and epigenetic evidence comes from general populations rather than professional nurses, limiting its direct application to nursing practice. Furthermore, nursing wisdom is shaped by multiple factors, including education, culture, professional experience, relationships, ethical values, and organizational context. Therefore, the proposed framework should be regarded as a conceptual and interdisciplinary perspective rather than a validated biological pathway.

Future Research

Future research should examine how biological, psychological, educational, experiential, and environmental factors interact in the development of nursing wisdom. Longitudinal studies involving nurses could investigate whether individual differences in empathy are associated with biological or epigenetic characteristics and how these factors interact with education, clinical experience, reflection, mentorship, and workplace environments. Further research should also examine whether empathy and compassion contribute to the development of clinical judgment and wisdom over time and whether structured educational, reflective, and mentorship interventions can strengthen these capacities. The development and validation of reliable instruments for measuring nursing wisdom, together with interdisciplinary research involving nursing, psychology, neuroscience, genetics, and epigenetics, may provide greater insight into how nurses progress from knowledge and experience to empathy, compassion, judgment, and wise action.

CONCLUSION

Nursing wisdom is best understood as a dynamic and multidimensional professional capacity rather than an inherited or biologically predetermined trait. Biological factors may contribute to individual differences in empathic potential, but the development and expression of wisdom are shaped by the continuing interaction of education, clinical experience, mentorship, relationships, reflection, compassion, and practice environments. The proposed framework therefore positions nursing wisdom as an evolving process in which nurses integrate knowledge, experience, empathy, ethical awareness, and clinical judgment to respond appropriately to complex situations. This perspective highlights the importance of professional learning and supportive clinical environments in nurturing the development of wise nursing practice.

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