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A Word from the General Editor…

Welcome to the 2025 edition of the *BHSU Remedy Scholarship Journal*.

Remedies rise from research. Solutions spring from scholarship.

The *BHSU Remedy Scholarship Journal* is a free, open-access journal in which Baptist University undergraduate and graduate students, faculty, staff, and administration address issues of historical and contemporary concern to the healthcare and health sciences community. The journal aims to present well-researched scholarship, information, and perspectives in a style suitable for all readers. The university's undergraduate Honors Program facilitates the journal as one of many efforts to fulfill the program's Scholarship & Research Advancement initiative. *Remedy* covers a broad range of topics in health care and health sciences. The suggested article length is 2,000 to 6,000 words, including references, following the submission guide and the style manual that is appropriate to the author's discipline. A Faculty/Staff editorial team, an Honors student editorial team, and a general editor review submissions. Articles are published in an annual electronic volume available on the BHSU website: www.baptistu.edu.

The 2025 edition showcases some of the research completed by members of the University community. *Remedy* is published each Fall term to complement our *Elevate Student Research Symposium* held each Spring term. Topics covered include collaboration in nursing education, improving maternal and newborn outcomes with continuous labor support, contraindications in imaging sciences, the positive effect of diet in preeclampsia prevention, benefits of humor in medicine, ketamine in treating depressive disorder, the exceptional uses of the stethoscope, and service learning through cultural immersion – a plethora of provocative topics curated for your informing, forming, and transforming our perspective. We hope you will find something useful and helpful as we celebrate the achievements of our academic community.

Thank you for your kind consideration.

To the advancement of scholarly research…

Best Regards,

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A Qualitative Investigation of Collaboration Among First-Year Bachelor of Science in Nursing Students

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Submitted: September 16, 2025
Program: Assistant Professor – Nursing, College of Nursing

Abstract

Despite the benefits of collaboration, first-year nursing students often prefer not to work together. Understanding why students resist collaboration is important. The purpose of this study was to explore first-year nursing students' perceptions of how instructor-created opportunities for collaboration contributed to their collaborative learning. Using Wenger's Communities of Practice (CoP) model as a lens, data were explored through a qualitative explanatory case study approach. The study consisted of individual interviews with 12 first-year nursing students. Inclusion criteria were enrollment in first-year nursing courses within a Bachelor of Science in Nursing (BSN) program in the United States. Data were analyzed using inductive, open-code thematic analysis. Results revealed student perceptions about successfully implementing collaborative opportunities that were not fully reflected in the existing literature. Themes indicated that faculty should assign smaller group sizes, allow students to choose their own group members, assign roles within groups, randomize groups regularly, allow students to evaluate other group members, schedule time for group work, and ensure that group work is purposeful. These insights have implications for improving nursing education and preparing graduates for effective intraprofessional collaboration.

Background

For nursing students to succeed, they must learn to collaborate during their education. Collaboration is the ability of two or more people to work together to solve a problem while retaining individual responsibility for outcomes (Ellis & Han, 2021). Successful collaboration supports deeper learning, communication skills, positive peer relationships, retention of material, and problem-solving ability (De Hei et al., 2020; Maddison & Strang, 2018; Palsson et al., 2021).

According to Buckley and Trocky (2019), nursing students voiced concerns about group work due to previous unsuccessful collaborative assignments and projects, which decreased their desire to work together. Students in other higher-education programs reported similar reasons for avoiding collaboration, including a lack of collaboration skills, a few members doing most of the work, low self-confidence in contributing to the group, and friendships that led to time spent on socializing rather than task completion (Lee et al., 2018).

Poor collaboration among practicing nurses has been linked to suboptimal patient outcomes (Institute of Medicine [IOM], 2011; Lankshear & Limoges, 2018). Nurses work in teams for extended periods to implement current care-delivery models (Berghout, 2021). Improved

intraprofessional collaboration can reduce burnout, produce better patient outcomes, and increase nursing's contribution to health care (Lankshear & Limoges, 2018).

Student nurses encounter ineffective collaboration in various clinical contexts, including clinical faculty bullying students, preceptors assigning unfair patient responsibilities to preceptees, and peers exhibiting rude or discourteous behaviors (Crawford et al., 2019). These uncivil behaviors have become normalized, as nursing students and novice nurses are often subjected to a "nurses eat their young" mentality (Aebersold & Scholville, 2020, p. 27). Students and nurses new to the profession who struggle to cope with academic and practice pressures—and who do not work collaboratively with colleagues—often leave school or the profession prematurely (Crawford et al., 2019).

Nurses in contemporary practice settings are required to work collaboratively with other health professionals and with one another (Boothby et al., 2019; Crawford et al., 2019; DiGregorio et al., 2019). The American Nurses Association (ANA) and the American Organization for Nursing Leadership (AONL) released a joint white paper, The Principles of Collaborative Relationships, underscoring the necessity of nurse collaboration to foster highly effective practice environments and improve patient care (ANA & AONL, 2022). Despite this need, Crawford et al. (2019) reported a lack of teamwork and nurse-to-nurse incivility, identifying 84 distinct negative outcomes. They also noted that a lack of intraprofessional collaboration often begins during nursing school.

Because clinical placements require smaller student groups, nursing students are frequently assigned to groups in clinical, laboratory, and classroom activities (Maddison & Strang, 2018; Terry et al., 2018; Zhang & Cui, 2018). However, simply placing students in groups does not guarantee successful collaboration (Berghout, 2021). Skilled nurse educators must intentionally design collaborative opportunities to achieve desired educational outcomes (Garner & Bedford, 2021; Nielson et al., 2019).

Literature Review

Collaboration is a skill that leads to positive educational outcomes for undergraduates. Collaborative learning—an andragogical approach often treated synonymously with collaboration—supports higher student motivation, higher-order thinking, metacognitive skills, and shared knowledge acquisition (De Hei et al., 2020; Lee et al., 2018; Saqr et al., 2018; Zhang & Cui, 2018). Working in groups enables constructive knowledge building through reflection (Maddison & Strang, 2018), social interaction and motivation (Falcione et al., 2019), increased self-efficacy (Kirkpatrick et al., 2018; Palsson et al., 2021), and development of communication, leadership, and teamwork skills (Badowski, 2019; Goh et al., 2020; Kirkpatrick et al., 2018). Despite these benefits, barriers are common: dysfunctional groups, poor communication, free riding, dominant personalities, unequal task distribution, and lack of collaborative skills (Ferdous & Karim, 2019; Ghufron & Ermawati, 2018; Lee et al., 2018). Nursing programs must also meet outcomes mandated by professional bodies that require collaboration (AACN, 2021; IOM, 2011; WHO, 2021; NLN, 2018).

Team-based learning (TBL) is widely used to promote collaboration. Evidence shows TBL can improve exam performance, teach teamwork, enhance application of content, shift learners from

passive to active modes, improve communication, and reduce future errors (Al-Hammouri et al., 2020; Cooke et al., 2019; Crawford, 2018; Currey et al., 2018; Siah et al., 2019; Goh et al., 2020; Berghout, 2021). Nevertheless, TBL remains underutilized by some nursing educators (Nielson et al., 2019). Faculty may lack formal preparation in pedagogy and face limited institutional support for active learning (Bullin, 2018; George et al., 2019; Alharbi et al., 2018; Falcione et al., 2019).

Method

The central concept in this study was the lack of student collaboration in nursing education. The research question was: What are first-year nursing students' perceptions of instructor-created opportunities for collaboration? The sampled population comprised first-year BSN students—either in the junior year of a traditional BSN or the first semester of an accelerated BSN. Participants were recruited using snowball sampling via social media, specifically Facebook groups aimed at nursing students. After obtaining permission to post a recruitment flyer, qualified participants were encouraged to share the opportunity with peers. Twelve first-year nursing students from various U.S. BSN programs who were not taught by the researcher were interviewed via Zoom. After confirming eligibility and obtaining informed consent, interviews averaged 45 minutes, were transcribed by Zoom, and corrected by the researcher. De-identified transcripts were sent to participants for member checking and subsequently hand-coded twice for themes and subthemes.

Results

Participants described perceptions of instructor-created collaborative opportunities. Six themes emerged: (1) smaller group sizes, (2) allowing students to choose group members, (3) assigning roles, (4) randomizing groups, (5) allowing evaluation of group members, and (6) scheduling time for group work. A seventh cross-cutting theme emphasized ensuring the purposefulness of group work. Representative statements included preferences for groups of three to four, requests to choose group members to improve communication, calls for designated roles (including leadership), regular rotation of groups, opportunities for peer and self-evaluation, scaffolded due dates with in-class/Zoom time, and clear links between group tasks and clinical practice.

Limitations

This study included only students accepted into BSN programs in the United States, excluding those in associate degree in nursing (ADN) programs and international students. In the U.S., students may earn either an ADN or a BSN and sit for the same NCLEX-RN. Additionally, some other countries have comparable educational pathways and regulatory examinations (National Council of State Boards of Nursing [NCSBN], n.d.).

Implications

These findings can inform the design of instructor-created collaborative opportunities. First-year nursing students' perceptions can help faculty incorporate structures such as smaller groups, role assignment, purposeful task design, peer evaluation, group randomization, and scheduled collaboration time.

Conclusions

Collaboration is a foundational soft skill for success in nursing education and practice. Yet students often resist collaboration, and faculty may be underprepared to teach it effectively. This study contributes student-informed guidance for more equitable and effective collaborative experiences, including smaller groups, choice of partners, assigned roles, randomized grouping, peer evaluation, scheduled work time, and purposeful design tied to clinical practice.

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The Role of Continuous Labor Support in Improving Maternal and Newborn Outcomes

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Introduction

Childbirth is a momentous experience in a woman's life that significantly impacts maternal and newborn health (Sutcliffe et al., 2023). The Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN, 2022) discusses that labor support includes all aspects of emotional, physical, and informational assistance. Continuous support has been recognized as a fundamental element of maternity care. This paper explores the benefits of continuous labor support, the role of family and healthcare providers, and the implications for improving maternal and newborn outcomes.

PICO Question

The PICO question that guided this research was, "In laboring women, does continuous support provided by healthcare personnel such as a nurse compared to no support result in improved outcomes with the birthing experience?".

Significance

The significance of this topic rests in the ability to highlight the impact of continuous labor support on maternal and newborn outcomes. By researching and exploring this topic, we can better understand how emotional, physical, and informational support can enhance physical and mental well-being during childbirth. The research conducted can also be used to advocate for incorporating continuous support and trained professionals into maternity care and ensure every woman experiences this care.

Literature Review

Relevant Concepts

The articles selected for this research collectively emphasizes the vital role of continuous labor support in improving maternal and newborn outcomes. Research on the psychological aspects of labor underlines the strong link between social support and reduced maternal anxiety as well as improved mental health (Bedaso et al., 2021; Dilcen et al., 2021). The impact of nursing support on labor outcomes is further explored, highlighting how nurses' beliefs and practices play a crucial role in shaping these results (Heelan-Fancher & Edmonds, 2021; AWHONN, 2022). Additionally, a relationship between nurse staffing levels and cesarean birth rates, indicates that sufficient professional support can contribute to improved birth outcomes (Lyndon et al., 2025). The inclusion of support persons and birth partners in labor care has been emphasized as crucial for promoting a patient-centered approach to childbirth (Nakphong et al., 2023; Sutcliffe et al.,

2023). The essential contribution of birth companions, midwives, and nurses in providing continuous support is reinforced, with a call for policy measures that ensure their active participation in maternity care (Evans et al., 2023). Consistent labor support has been linked to more efficient labor progression and higher rates of vaginal births (Stjernholm et al., 2021). Social support during pregnancy is presented as a multifaceted concept, including emotional, instrumental, informational, and spiritual, with its benefits explained through theories highlighting its role in enhancing well-being and reducing stress (Al-Mutawtah et al., 2023). Overall, the literature consistently advocates for the integration of continuous, culturally sensitive support throughout pregnancy and labor as a standard of care to improve both physical and emotional outcomes for women.

Critical Analysis

This body of research emphasizes the pivotal role of continuous labor support in improving both maternal and newborn outcomes. Evidence from various studies highlights the positive impact of continuous labor support on clinical and emotional outcomes (Stjernholm et al., 2021). Consistent support has been shown to improve labor progression and increase the likelihood of vaginal delivery, particularly among first-time mothers (Stjernholm et al., 2021). These benefits are supported across the literature, though their implementation can vary based on provider attitudes and institutional practices (Heelan-Fancher & Edmonds, 2021). Professional guidelines also advocate for structured support models to enhance outcomes (AWHONN, 2022). Emotional and social support further contributes to better mental health, helping to reduce stress and anxiety during pregnancy (Bedaso et al., 2021).

The involvement of birth companions and integration of support networks are also recognized as key to improving maternal satisfaction though challenges such as inconsistent policies and limited provider training remain (Evans et al., 2023; Nakphong et al., 2023). Nurse staffing levels have also been linked to cesarean birth rates, pointing to broader systemic factors affecting care (Lyndon et al., 2025). Despite the known benefits, disparities in access to support raise concerns about equity and consistency in maternal care.

Adding a qualitative aspect, Al-Mutawtah et al. (2023) explore women's diverse experiences of social support during pregnancy. Their synthesis reveals both the empowering and disheartening aspects of support, ranging from meaningful emotional connections to feelings of neglect or unmet expectations, noting that meaningful care fosters well-being, while gaps in support contribute to stress and isolation. Ultimately, the findings feature the importance of empathetic, culturally sensitive, and equitable support throughout pregnancy and childbirth.

Methodology

Research designs

The selected literature on continuous labor support incorporates a variety of research designs, each offering distinct contributions to understanding its effects on the outcomes of mother and baby. This literature includes systematic reviews, meta-analyses, randomized controlled trials, observational studies, cross-sectional surveys, mixed-methods research, and qualitative syntheses to investigate the impact of continuous labor support on maternal and newborn outcomes. Collectively, these clinical guidelines, meta-analyses, and trials demonstrate that labor support improves delivery outcomes and maternal mental health (AWHONN, 2022; Bedaso et al., 2021;

Stjernholm et al., 2021). Psychological effects and provider perspectives are explored through observational and mixed-method studies (Dilcen et al., 2021; Heelan-Fancher & Edmonds, 2021; Evans et al., 2023). While some articles discuss women's experiences and coping strategies during labor through surveys and meta-ethnographic synthesis (Nakphong et al., 2023; Sutcliffe et al., 2023), others provide a culturally diverse view of social support in pregnancy through a qualitative systematic review (Al-Mutawtah et al., 2023). Furthermore, system-level insights are offered through research on nurse staffing and cesarean rates (Lyndon et al., 2025). Together, their varied methodologies provide a well-rounded understanding of the clinical and emotional benefits of continuous labor support.

Data Collection Methods

The diverse data collection methods employed across these studies significantly strengthen the overall body of evidence on continuous labor support, offering both depth and breadth in understanding its impact. A systematic review synthesized existing research to evaluate how labor support promotes vaginal births and improves perinatal outcomes (AWHONN, 2022). Quantitative surveys were employed to assess psychological well-being and perceptions of traumatic childbirth, providing measurable data on emotional experiences during labor (Dilcen et al., 2021). Retrospective observational analysis using hospital data allowed researchers to examine the association between nurse staffing levels and cesarean delivery rates offering insights into systemic influences on birth outcomes (Lyndon et al., 2025).

A meta-ethnographic approach helped synthesize qualitative research on how birth partners and care providers shape women's coping strategies during childbirth education and labor (Sutcliffe et al., 2023). Meta-analysis techniques were used to aggregate findings across multiple studies, evaluating the overall impact of labor support on maternal mental health, birth satisfaction, and newborn health (Bedaso et al., 2021). Experimental evidence was provided through a randomized controlled trial that compared outcomes between women with and without continuous support during labor, establishing clear links between support and improved delivery outcomes (Stjernholm et al., 2021).

Cross-sectional surveys offered insight into women's preferences and real-time experiences with support persons during labor, helping to contextualize the role of support in shaping the birth experience (Nakphong et al., 2023). Interviews and focus groups captured rich, qualitative data from women, healthcare professionals, and birth companions, revealing their views on the value and implementation of continuous labor support (Heelan-Fancher & Edmonds, 2021; Evans et al., 2023). One study stood out for combining qualitative and quantitative techniques to explore both the personal experiences of birth companions and measurable outcomes, offering a comprehensive view of labor support (Evans et al., 2023).

In addition, a qualitative systematic review synthesized data from fourteen studies, primarily based on semi-structured interviews and focus group discussions, to explore pregnant women's experiences of social support across different cultural contexts (Al-Mutawtah et al., 2023). Together, these studies reflect the strength of using varied yet complementary data collection methods, which provide statistically grounded findings and context-rich insights into how continuous labor support influences both clinical outcomes and the lived experiences of birthing individuals.

Data Analysis Procedures

The reviewed literature incorporates a wide range of data analysis methods to evaluate the influence of continuous labor support on maternal and newborn outcomes, offering both quantitative and qualitative insights. Systematic reviews and meta-analyses used statistical measures such as odds ratios and risk ratios to evaluate labor progression, cesarean delivery rates, and maternal satisfaction, synthesizing data from multiple studies to assess the benefits of labor support (Bedaso et al., 2021; AWHONN, 2022). Randomized controlled trials utilized inferential statistics like t-tests and chi-square tests to compare outcomes between supported and unsupported birthing individuals, demonstrating improvements in delivery methods and labor duration (Stjernholm et al., 2021).

Qualitative and mixed-methods studies offered additional insight into the emotional and psychological dimensions of labor support. Interviews and thematic analysis explore how consistent support helped reduce feelings of trauma and distress during childbirth (Heelan-Fancher & Edmonds, 2021; Evans et al., 2023). Cross-sectional surveys and regression models examined how women's preferences for support persons influence delivery experiences and outcomes (Nakphong et al., 2023). Similarly, the relationship between psychosocial well-being and perceived trauma during childbirth was assessed through statistical predictors of mental health outcomes (Dilcen et al., 2021).

Meta-synthesis techniques brought together qualitative data from various sources to present a unified understanding of labor support's role in enhancing coping strategies during childbirth (Sutcliffe et al., 2023). Thematic synthesis identified recurring patterns of support —emotional, instrumental, informational, and spiritual —offering culturally diverse insights into women's pregnancy experiences (Al-Mutawtah et al., 2023). Regression analysis also revealed that higher nurse staffing levels in labor settings were associated with reduced cesarean rates, pointing to the importance of institutional factors in labor support (Lyndon et al., 2025).

Collectively, these analytical strategies emphasize the multidimensional value of continuous labor support, demonstrating its role in improving clinical outcomes and enhancing emotional well-being across various populations and care environments.

Results

Data Presentation

The combined findings from the reviewed literature highlight the broad and significant advantages of continuous labor support for both maternal and newborn outcomes. Ongoing support during childbirth has been linked to reduced cesarean rates, a higher likelihood of vaginal delivery, and greater maternal satisfaction with the birthing experience (Bedaso et al., 2021). Women who received continuous support also reported feeling more empowered and experienced fewer traumatic birth perceptions, reinforcing the emotional and psychological value of such care (Evans et al., 2023). Supportive labor environments have been associated with improved mental health, including lower rates of postpartum anxiety and depression (Dilcen et al., 2021). These findings align with evidence suggesting that structured, continuous labor support improves intended vaginal birth rates and general perinatal outcomes (AWHONN, 2022).

Further evidence emphasizes the clinical benefits of labor support including enhanced labor progression and reduced reliance on medical interventions, particularly when support is provided

by nurses or birth companions (Stjernholm et al., 2021; Nakphong et al., 2023). From a systems-level perspective, increased nurse staffing during labor has been associated with fewer cesarean births, highlighting the impact of institutional support on maternal outcomes (Lyndon et al., 2025). On a more personal and cultural level, social support during pregnancy has been categorized into key areas such as emotional, practical, informational, and spiritual support, with women drawing strength from partners, families, cultural rituals, and healthcare networks (Al-Mutawtah et al., 2023). This study also identified challenges, such as emotional strain or unmet expectations, particularly when support from partners or caregivers was lacking.

Healthcare providers' perspectives are also essential to understanding the delivery of labor support. Nurses' beliefs and institutional policies can shape the consistency and effectiveness of support provided during labor (Heelan-Fancher & Edmonds, 2021). Similarly, supportive relationships with birth partners and caregivers play a crucial role in helping women cope with the physical and emotional intensity of childbirth (Sutcliffe et al., 2023). Altogether, this body of research illustrates that continuous labor support contributes not only to improved physical health outcomes but also to emotional well-being, emphasizing the importance of culturally sensitive, patient-centered, and systemically supported care practices.

Discussion

Interpretation of Findings

The findings from the ten key studies consistently uphold the diverse and significant advantages of continuous labor support for both maternal and newborn outcomes. A number of these studies concentrate on physical birth outcomes and the reduction of unnecessary interventions. Evidence from systematic reviews and randomized controlled trials shows that consistent support during labor is linked to lower cesarean section rates and higher rates of vaginal births (Bedaso et al., 2021; Stjernholm et al., 2021). Similarly, structure support practices have been associated with improved delivery outcomes and an increase in intended vaginal births (AWHONN, 2022). At a broader systems level, institutional support, such as adequate nurse staffing, has also been tied to reduced cesarean rates, highlighting the importance of resource availability in shaping labor outcomes (Lyndon et al., 2025).

Beyond clinical results, several studies highlight the psychological and emotional benefits of continuous support. Positive mental health outcomes, including greater self-efficiency and reduced perceptions of trauma, have been observed among women who received consistent labor support (Dilcen et al., 2021). The presence of birth companions and engaged care providers has also been shown to strengthen emotional resilience and promote effective coping during labor (Evans et al., 2023; Sutcliffe et al., 2023). A broader perspective on support is offered through a thematic synthesis that identifies the emotional, instrumental, spiritual, and social dimensions of support across diverse cultural settings, while also recognizing the negative emotional impacts associated with a lack of adequate support (Al-Mutawtah et al., 2023).

The empowering effects of continuous labor support are equally important. Women who had access to a supportive presence during childbirth reported feeling more confident and in control throughout the birthing process (Nakphong et al., 2023). The beliefs and attitudes of healthcare providers also emerged as influential, shaping the consistency and effectiveness of support practices depending on both institutional norms and individual values (Heelan-Fancher &

Edmonds, 2021). These findings were reinforced by additional data showing that continuous labor support enhances overall satisfaction with the birthing experience, emphasizing its dual role as a clinical and relational intervention (Stjernholm et al., 2021). Collectively, the evidence highlights that continuous labor support, whether provided by nurses, doulas, or birth companions, not only improves physical outcomes and reduces interventions but also fosters emotional well-being and empowers women during one of the most significant moments of their lives.

Limitations and implications

The limitations across the literature on continuous labor support reveal several important factors that influence the generalizability and consistency of research findings. One common limitation is the variation in research design and study settings, which complicates the comparison of outcomes across diverse populations and healthcare systems (Bedaso et al., 2021). Some studies, such as those by Nakphong et al. (2023), focused on specific groups, like first-time mothers or women in well-resourced facilities, restricting the applicability of the findings to broader or underserved populations. Many studies also relied heavily on self-reported data, which can introduce bias, particularly when assessing women's subjective experiences of labor support (Dilcen et al., 2021; Evans et al., 2023).

Although studies like those by Stjernholm et al. (2021) and Sutcliffe et al. (2023) provided meaningful insights into the emotional and psychological impacts of continuous support, they often lacked analysis of how different types of support, whether from nurses, doulas, or companions, function within varying cultural and institutional contexts. Additionally, healthcare providers' personal beliefs and professional attitudes toward labor support can influence its delivery, potentially affecting the consistency and quality of care provided (Heelan-Fancher & Edmonds, 2021). Methodological limitations were also noted in Al-Mutawtah et al. (2023), where the inclusion of only English-language studies may have excluded culturally specific insights from non-English speaking populations. Furthermore, the included studies varied in methodological rigor, with some lacking transparency in ethical practices and data analysis, and subgroup differences by socioeconomic or demographic characteristics were not always explored, limiting the depth of understanding across diverse populations.

In addition to these limitations, several systemic barriers were identified across the reviewed literature that further restrict the effective implementation of continuous labor support. A significant obstacle is the lack of institutional policies and standardized guidelines supporting the consistent use of labor support practices across healthcare facilities (Evans et al., 2023). Without such protocols, the role of support persons—whether doulas, birth companions, or nurses—may be undervalued or inconsistently integrated into care. Another critical barrier is inadequate nurse staffing, which reduces the capacity to provide one-on-one support during labor; this has been linked to increased cesarean rates and lower care quality (Lyndon et al., 2025). Additionally, healthcare provider attitudes, shaped by personal beliefs and cultural norms, may prevent effective delivery of labor support, especially where non-clinical support is deprioritized (Heelan-Fancher & Edmonds, 2021). There are also notable disparities in access to support services based on race, geography, and socioeconomic status, which contribute to unequal maternal outcomes. Finally, language limitations in the literature—such as the exclusion of non-English studies—can obscure culturally specific practices and experiences of labor support (Al-Mutawtah et al., 2023). These barriers underscore the need for system-level reforms, including

investment in workforce capacity, culturally competent training, and inclusive policy development.

Despite these limitations, the body of research supports the conclusion that continuous labor support improves physical outcomes, such as lowering cesarean rates, and promotes better mental health for birthing individuals (AWHONN, 2022; Lyndon et al., 2025). These findings suggest that healthcare providers should prioritize culturally competent care and actively engage families and partners in antenatal and intrapartum support. Interventions that strengthen emotional and informational support systems are particularly important in environments where traditional support networks are limited. Policymakers are also encouraged to embed community-based and culturally responsive support frameworks within maternal health services to foster more holistic care approaches.

Considering evolving healthcare models and communication tools, future research should address underrepresented populations and examine newer forms of support, such as virtual or digital platforms, especially considering shifts in care delivery following the COVID-19 pandemic (Al-Mutawtah et al., 2023). Overall, these findings highlight the need for healthcare systems to develop and implement policies that guarantee access to continuous labor support, particularly in settings where such care is inconsistent or unavailable. Continued investigation is essential to identify the most effective types of support, assess their impact across varied populations, and integrate their sustainability into clinical practice to enhance outcomes for mothers and newborns.

Conclusion

Summary of findings

Continuous labor support is essential to evidence-based maternity care and has demonstrated significant benefits for maternal and newborn health (AWHONN, 2022). Integrating labor support personnel into standard obstetric care has the potential to improve birth outcomes and patient satisfaction while reducing unnecessary medical interventions and reducing labor duration. As labor support continues to gain recognition as a crucial aspect of childbirth care, addressing systemic barriers that limit accessibility becomes imperative.

Final thoughts and recommendations

The healthcare system can move toward a more comprehensive, patient-centered approach to maternity care by advocating for policy changes, increasing provider education, and expanding support programs (Evans et al., 2023). Future studies should also investigate the role of technological advancements, such as virtual support, in providing continuous labor assistance in settings where in-person support is limited. The studies should focus on broadening access to labor support services and evaluating their effectiveness in various demographic and healthcare contexts. Future studies should also investigate the lasting effects of labor support on maternal mental health, postpartum recovery, and infant development to solidify further its role in improving birth outcomes worldwide.

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Contraindications for CT and MRI Studies

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Abstract

Radiographic exams often cannot be performed for a multitude of reasons. Moreover, there are many contraindications for exams that are specific and separate to Computed Tomography (CT) and Magnetic Resonance Imaging (MRI). Contraindications for CT usually revolve around the contrast media used or its high level of ionizing radiation where the risks outweigh the benefits, such as with irradiating a pregnant patient, or where the ionizing radiation damages a device, such as a glucose monitoring device. In MRI, the list of contraindications is far longer, revolving around the many medical implants and devices, clothing accessories, contrast media contraindications from allergic reactions or kidney conditions, and pregnancy and breastfeeding. The goal of this study is to aid radiologic technologist students to safely perform radiographic imaging exams by giving a tool to help learn about CT and MRI exam contraindications.

Introduction

Vital to the care of patients around the world is medical imaging. Without such, there would not be accurate diagnoses made for patient's treatment. In some instances, receiving a proper diagnosis can be the turning point in one's future and may even be crucial to saving one's life. However, there are cases where performing a diagnostic exam contains greater risks than not. When the risks outweigh the benefit for medical imaging, it is said that there is a contraindication for the exam. The exam should not be performed, and an alternative must be used unless the cause of the contraindication is removed or undone.

The following study is the compilation of research regarding safety within CT and MRI, statistical reports of adverse events that have occurred in the modalities, contraindications for CT and MRI exams, and alternative routes to take if the exam is contraindicated. The goal of this study is to provide a tool for radiologic technologist students to have, which will help these students learn how to optimally care for patients.

CT Safety

CT safety is not as heavily acknowledged as MRI. Radiation is recorded after every CT study in order to keep track of how much radiation a patient gets. Radiation dose is 100 times higher in CT studies than conventional radiography. Some institutions use breast shields for men and women, but it is harder to shield the body from radiation in these types of studies. Radiographers should not be present in the room when the CT machine is on; they should stay behind a primary lead barrier or at least 6 feet away in distance.

Contraindications for CT Exams

The main contraindication of CT studies is the administration of IV contrast. Studies ordered with contrast must be confirmed through allergies and creatinine levels of the patients. If a patient is allergic to IV contrast, the CT study must be performed without contrast after verbal order from the radiologist or doctor. Creatinine levels must be in the range of 0.6-1.2 mg/dL. If a patient's creatinine levels are too low or too low, the radiologist must be consulted for further instruction. Another contraindication may be that the patient is claustrophobic.

Alternatives for Contraindicated CT Exams

Contraindicated CT exams can be easily resolved. CT exams ordered with contrast can be easily reversed and ordered without contrast. Patients can be positioned in multiple ways to accommodate for non-authentic positioning.

MRI Safety

Although magnetic resonance imaging does not have the danger of ionizing radiation seen in CT, MRI has plenty of its own safety concerns. An MRI department has four zones, which are all labeled with bright signs. The first zone is any area completely outside of the department, such as a hallway outside. Zone number two is the area where patients check in and the dressing room where patients can lock up their belongings and change into a metal free gown. Zone three is the area where only screened patients and personnel can enter. This is also the control room where MRI technologists run MRI scans. And zone four is the room with the magnet and where the danger can occur.

Most commonly, MRI machines have a main magnetic field of either 1.5 Tesla or 3.0 Tesla. The field strength of 1 Tesla is equal to 10,000 times the gravitational pull of the earth. Although no known health hazards are associated with temporary exposure to the MRI environment (2017), three main safety concerns have been recorded including:

- "Attracting magnetic objects of all sizes that may become projectiles and cause damage to the scanner or injury to the patient or medical professionals.
- Creating loud knocking noises which may harm hearing or may cause peripheral muscle or nerve stimulation that may feel like a twitching sensation.
- Heating of the body, especially during long MRI examinations" as thermal events are the most common serious injury reported in MRI (2017).

However, the danger of the more common thermal events is small compared to the potential outcome of ferromagnetic materials entering the MRI suite.

Contraindications for MRI Exams

Whenever a ferromagnetic material enters the MRI suite, the strong field of the magnet can cause the object to be dangerous or even lethal. Ferromagnetic material can be accelerated by the magnet to high speeds and become projectiles. To prevent ferrous material from entering the MRI suite, patients are often given a form to fill out to answer questions regarding potential metal existing on them or inside of them as a result surgery. Many surgeries are listed as potential contraindications for the exam as the magnetic field is able to move aneurysm clips to cause a

brain bleed, affect the function of devices, such as a pacemaker or pump, or displace implants (Ghadimi & Tafti, 2023). However, ferrous metal is not the only reason why an MRI examination can be contraindicated. Other issues such as known contrast media allergic reactions can contraindicate a contrast exam from being performed. Ghadimi and Sapra, 2023 categorize contraindications in MRI into either absolute contraindications, relative contraindications, contrast media, or pregnancy and breastfeeding.

Absolute contraindications

Absolute contraindications are those where the exam should never be performed unless the contraindication is removed. One of the most common absolute contraindications are MRI cardiac implantable electronic devices (CIED) such as certain "pacemakers, implantable cardioverter defibrillators (ICDs) and cardiac resynchronization therapy (CRT) devices" (Ghadimi & Tafti, 2023). Not all CIEDs are MRI non-safe. In MRI, devices are classified as either MRI safe, MRI conditional, or MRI non-safe. For example, an MRI non-safe device is an absolute contraindication as danger is unavoidable with it. But an MRI conditional device is able to be temporarily deactivated so that the patient can safely have the exam done. For MRI conditional devices, the device is usually deactivated over the phone with the manufacturer prior to the patient entering the MRI suite.

Metal fragments in the eye, usually due to welding or a facial injury with metal are another danger to question patients about before entering the MRI suite. If they answer yes, then an orbit x-ray must be taken and reviewed by the radiologist for approval before the MRI (Ghadimi & Tafti, 2023). The same is done for other "metallic fragments such as bullets, shotgun pellets, and metal shrapnel" (Ghadimi & Tafti, 2023).

Also classified as absolute contraindications are numerous implants and devices. Implantable neurostimulators, cochlear implants with battery intact, drug infusion pumps, catheters with metallic components, aneurysm clips, magnetic dental implants, tissue expanders, artificial limbs, hearing aids, and piercings (Ghadimi & Tafti, 2023).

Relative contraindications

Relative contraindications are those that require caution before proceeding with the exam. A coronary artery stent is a good example of a relative contraindication. A patient with a stent is able to have an MRI exam in some cases but not always. Potential hazards such as the stent being placed too recent would allow it to be more likely to move than if scar tissue has had time to build around it. Other relative contraindications tend to surround other devices and implants, such as programmable shunts that must be reprogrammed after magnetic interference, airway stents or tracheostomy that are not plastic, certain intrauterine devices (IUD), ocular or penile protheses, stapes implants, surgical clips or wire sutures, joint replacements or prostheses, inferior vena cava (IVC) filters if the MRI is scheduled six weeks after implantation, medication patches, Harrington rods with scanners with greater than 1.5 Tesla, tattoos "if the tattoo is in the area of interest and is less than six weeks old" since tattoos contain ferromagnetic pigments, or colonoscopy procedures within the last eight weeks (Ghadimi & Tafti, 2023).

Contrast media contraindications

MRI uses gadolinium chelates as contrast. Some MRI contrast media differ in viscosity and osmolality, but all forms are considered to be relatively very safe (Ghadimi & Tafti, 2023) as

gadolinium chelates cause far fewer allergic reactions than contrast media used in CT. However, certain patients require caution before administration of MRI contrast. Contraindication for MRI contrast revolves around kidney function because contrast in MRI is injected intravenously and filtered through the kidneys. Patients who require caution before receiving IV contrast are patients on dialysis, patients with a history of renal disease, such as kidney transplant, having a single kidney, or renal cancer; patients who have received contrast in the last 24 hours, "patients who have risk factors for nephrogenic systemic fibrosis (NSF), patients with diabetes mellitus or hypertension who are receiving treatment with medications" as their glomerular filtration rate may be low, any patient with a glomerular filtration rate below 35 mL/min/1.73 m2 as the radiologist should weigh the risks, patients who are pregnant as pregnancy is another risk versus benefit question the radiologist decides, and patients who have a previous history of contrast media allergic reactions (Ghadimi & Tafti, 2023).

Pregnancy and breastfeeding

MRI exams are useful for pregnant patients due to the absence of ionizing radiation; however, contrast media in MRI has not been determined to be safe by the FDA and is thus avoided. For the same reason, a mother who currently breastfeeds a child is not known to be safe and is also avoided since 0.04% of the dose injected into the mother is passed on through the breastmilk (Ghadimi & Tafti, 2023).

Conclusion

Unfortunately, the danger of the strong magnetic field is not known to all, and many events of dangers within the MRI suite have been recorded and termed sentinel events. Sentinel events are events where the patient or personnel's condition results in "death, permanent harm, or severe temporary harm" (Sentinel Event, 2024). Sentinel events are more common in MRI than in other modalities since one mistake can immediately cause an event. However, sentinel events are also recorded in CT, usually as a result of overexposure. Contraindications in CT and MRI are vital for graduating students to understand as radiologic technologists are responsible for the care of their patients. If contraindications are overlooked or ignored, ionizing radiation overexposure, severe injury, or death may occur to patients or personnel. Moreover, if a technologist allows a sentinel event to occur, not only will they be allowing potential harm to others, but they also risk being terminated from their position.

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Diet and Preeclampsia: An Evidence-Based Project

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Introduction

According to Kabir et al. (2024), "pre-eclampsia (PE) is a hypertensive disorder present after 20 weeks of gestation and complicates pregnancy approximately 2-8% globally… annually, PE accounts for 50,000 maternal deaths" (para. 2). In the United States "five to seven percent of all pregnant women get preeclampsia" (Rana et al., 2019, para. 2). This condition is a major problem in Tennessee, with 48% of deaths being related to preeclampsia between 2017 to 2020 (Tennessee Department of Health, 2022). There is also a higher incidence of PE in the South and Mid-South compared to other regions of the United States (Rajendran et al., 2024). Risk factors for preeclampsia include diabetes mellitus, obesity, and hypertension. A high incidence of all three substantially increases the risk of developing preeclampsia during pregnancy. All three of these risk factors are highly prevalent in the local population. Measures to lessen the impact or prevent this condition include weight management, blood sugar control, and blood pressure management. Because weight management affects blood pressure and diabetes, we decided to explore the impact of diet on preeclampsia. This project explores diet as a measure to help lower the incidence of preeclampsia given that nutrition is a modifiable risk factor for the condition. It is also important to note that obesity has been identified as the only risk factor associated with pre-eclampsia (Elawad et al., 2024).

Clinical Problem and Local Initiative

The exact pathophysiology or cause of pre-eclampsia is uncertain, but pre-eclampsia is described as a placental condition that occurs with excretion of contaminants that enter the mother's bloodstream (Rana et al., 2019). Preeclampsia is a very real problem impacting women in this area. Regional One Health became a member of a statewide organization called the Tennessee Initiative for Perinatal Quality Care (TIPQC) to combat this issue. The TIPQC program, while addressing pre-eclampsia, overall targets improved postpartum care, childbirth, and pregnancy outcomes (Regional One Health, 2024). Since Dr. John Schorge joined the medical facility in 2022 leading the Obstetrics and Gynecology Service at Regional One, the facility reports it is one of the best hospitals in the state for treating the condition. Focusing on the topic of preeclampsia, the goal of TIPQC was treating the high blood pressure associated with preeclampsia within 60 minutes of diagnosing the condition (Regional One Health, 2024). Regional One Health has reported that this benchmark was met in 96% of patients treated with

pre-eclampsia. Early prenatal care, which includes a healthy diet, is also encouraged to mitigate development of the condition.

Treatment of Preeclampsia/Clinical Practice Guidelines

Clinical practice guidelines exist as a means to treat pre-eclampsia. Because high blood pressure is a hallmark of preeclampsia, blood pressure control is the main focus of treatment. Blood pressure or anti-hypertensive medications used in the treatment include labetalol, hydralazine, nifedipine, methyldopa, and hydrochlorothiazide. These drugs are to decrease the blood pressure to less than 160/110 (University of Cincinnati, 2022). Daily intake of a low-dose aspirin is recommended for women who have more than one risk factor for preeclampsia (American College of Obstetricians and Gynecologists, 2021). Low-dose aspirin is used to prevent or delay the onset of symptoms of the condition. It is also important to advise pregnant women at risk for or with preeclampsia to adopt healthier habits, such as managing weight, maintaining a balanced diet, exercising regularly, and limiting salt intake.

Significance to Nursing

Preeclampsia is a profound concern for nursing due to the complications that can be associated with it. Issues with pre-eclampsia, in addition to high blood pressure, can be organ damage or heart problems, or seizures (Karrar et al., 2024). Preeclampsia can be a fatal complication, which is why nurses must play an important role when helping patients manage or prevent this condition. Nurses must be aware of signs and symptoms, and risk factors associated with pre-eclampsia to adequately treat and educate patients. As nurses, we need to educate the patient on preventive measures that include daily monitoring of their glucose levels/blood pressure, diet, and signs and symptoms of preeclampsia such as increasing blood pressure, edema, and elevated levels of albumin in the urine (Yang et al., 2022). Informing the patient that hypertension is indicated by a systolic pressure greater than or equal to 140 mmHg or a diastolic pressure greater than or equal to 90 mmHg could be an important measure in managing and identifying preeclampsia (Karrar et al., 2024). This, along with other indicators such as kidney issues, proteinuria, low blood platelet count, and elevated liver enzymes, is used in detecting this condition.

Along with being able to recognize the aforementioned signs and symptoms of pre-eclampsia, knowing risk factors can help one be able to take preventive measures and help minimize the risks for both mom and baby. Nurses must consider the nonmodifiable and modifiable risk factors such as obesity, kidney disease, diabetes, high blood pressure, maternal age of forty or older, autoimmune disorder, and African American ethnicity (Eunice Kennedy Shriver National Institute of Child Health and Human Development, n.d.). Diet impacts all these risk factors except for maternal age and ethnicity. Health disparities such as low income, environmental living conditions (i.e., food deserts), and transportation (i.e., access to health care) are also important risk factors to consider. The presence of these risk factors has the potential to increase the chances of developing preeclampsia. Without the means to get healthy food and adequate

access to medication and health care, prenatal care with early identification of any potential problems in pregnancy may not be achievable.

Preventive or early care is vital to prevent pregnancy complications such as fetal growth restrictions, placental abruption, and preterm birth (Karrar et al., 2024). By utilizing knowledge of diagnostic criteria, signs and symptoms and risk factors, nurses cannot only better educate the patient but also quickly detect signs of preeclampsia leading to prompt treatment and improving outcomes for both the mother and the baby.

Diet

Sources previously identified (i.e., TIQPC, Regional One Health, clinical practice guidelines), all acknowledge the importance of early prenatal care. Early prenatal care includes encouraging a healthy, balanced diet, as well as weight management, and control of any health issues such as diabetes. A healthy diet is therefore one key to better outcomes not only for the mother but also for the baby.

According to the World Health Organization (WHO; 2020), a balanced diet consists of five portions of fruits and vegetables, six to eight glasses of water, nuts, and whole grains. Studies have been conducted that corroborate the benefits of a healthy diet as defined by the WHO. In a systematic review and meta-analysis conducted by Kibret et al. (2018) 21 studies identified adherence to a healthy dietary pattern (i.e., intake of vegetables, fruits, legumes, whole grains, and fish) as being significantly associated with lower odds of developing preeclampsia, gestational diabetes, and pre-term birth. Researchers conducting an evidence review reported that vitamin D, calcium, iron, and a healthy maternal diet (supporting WHO guidelines) were nutritional factors involved in pre-eclampsia prevention (Kinshella et al., 2023). Similarly, Perry et al. (2022), acknowledged in a narrative literature review the benefit of eating a diet consisting of fruits and vegetables, plant-based foods, fish, and vegetable oil with limited intake of foods high in fact, sugars, and salt. The researchers characterized the latter food intake as being associated with a Western diet (i.e., high in red and processed meat, potatoes, and white bread) and higher rates of pre-eclampsia. Perry et al. stress the importance of maintaining a healthy weight before conception; but also recognize that women at risk of preeclampsia, who are overweight and/or obese, may benefit from weight reduction interventions as a measure to prevent excessive gestational weight gain. Another systematic review and meta-analysis conducted by Paula et al. (2022), found that a diet high in ultra-processed foods that are hallmarks of the Western diet (i.e., high in sugar, fat, salt, and low in fiber such as fast foods and processed meat) is associated with an increased risk of gestational diabetes and preeclampsia. These researchers also reported that maternal nutrition should be addressed before women become pregnant as well as during pregnancy to achieve successful outcomes for mother and baby.

The Mediterranean Diet

A Mediterranean diet fulfills the dietary requirements of eating a diet high in fruits and vegetables, legumes, whole grains, and fish. The food choices in the Mediterranean diet are comprised mainly of three or more servings a day of fruit, four or more servings of vegetables each day, seafood two or three times each week, four or more servings of grain each day, three or more servings of dried beans and legumes, and yogurt, cheese, eggs, and poultry each week (Kabir et al. 2020). Aspects of the Mediterranean diet enhance vascular function by increasing the production of nitric oxide and nitro fatty acids in the walls of blood vessels, leading to vasodilation (Rissetto, 2023, para.5). Food choices associated with the diet do not contain many saturated fats, so instead of increasing cholesterol, they decrease it and can lower blood pressure. Lowering blood pressure is extremely important, since elevated blood pressure is the hallmark of preeclampsia. Incorporating the Mediterranean diet may not only reduce the incidence of pre-eclampsia but also promote overall maternal health.

Investigations have been conducted exploring the Mediterranean diet and pre-eclampia. The study by Kibret et al. (2018) discussed in the previous section equated the healthy dietary pattern consisting of vegetables, fruits, legumes, whole grains and fish resulting in lower pre-eclampsia with the Mediterranean diet. Al Wattar et al. (2019), in a study conducted in the United Kingdom, randomizing subjects to a Mediterranean style diet versus a control group receiving usual diet recommendations for antenatal care and weight management, reported that while there was a significant reduction in the odds of developing gestational diabetes there was no significant reduction in preeclampsia. The researchers stated that the sample consisted of mostly multigravida subjects which may have explained the low incidence of pre-eclampsia since the condition occurs mainly in subjects during the first pregnancy. In a study by Minhas et al. (2022), the researchers reported women adhering to a Mediterranean diet had more than 20% lower odds of developing preeclampsia after adjusting for confounders (i.e., sociodemographic and preexisting risk factors). It is important to note that the racially and ethnically diverse population in the study was similar to that in our local area.

Barriers to Implementing a Healthy/Mediterranean Diet

Tennessee was rated as the 39th state according to the amount of people who eat fruits and vegetables (Stacker, 2022). There are 43% of adults who eat less than one portion of fruit a day and 19% percent of adults who consume fewer than one serving of vegetables a day (Stacker). The health disparities mentioned earlier, such as low income, environmental living conditions (i.e., food deserts), and transportation (i.e., access, may offer insight into the reasons why people may not eat healthy food. Twenty-one percent of the population in Tennessee lives in food deserts (Tennessee Advisory Commission on Intergovernmental Relations, 2019). This means it may be a struggle for people to get to a place with healthy food. Fresh fruits and vegetables may not be available if there is not a food market located nearby or transportation for access. Fresh food and food associated with the Mediterranean diet may be more expensive therefore cost

becomes an issue. Additionally, support systems (e.g., family members, significant others) that can provide needed assistance may not be readily available. Furthermore, due to the area in which one lives or culture, people may not be aware of the Mediterranean diet or how effective it can be as a healthy diet.

Levels of Prevention and Ways to Intervene

There are three levels of prevention: primary, secondary, and tertiary.

In terms of the Mediterranean diet preventing preeclampsia, primary prevention is based on educating women who are planning on having kids to use this diet in their pre-pregnancy care. The focus of this prevention is preventing pre-eclampsia. Before a woman has a baby, this diet can help with fertility, lessen inflammation, and lower high blood pressure (Walsh, 2024). Secondary prevention is based on early detection, so women already have some early preeclampsia or high blood pressure. Implementing this diet for women with preeclampsia can lessen more severe complications due to its effects of lowering blood pressure. This is because the diet consists of unsaturated fats (Blood Pressure UK, n.d.). Tertiary prevention is managing the complications of preeclampsia. Education is again important as a means to ensure appropriate post-natal care (e.g., medication management). Although not directly related to preeclampsia, there is some evidence that suggests that the Mediterranean diet can help decrease the risk of depression in the postpartum period (Bascom, 2023). Further research needs to be conducted on this topic, but the evidence suggesting a connection between postpartum depression and preeclampsia (Caropreso et al., 2019) cannot be ignored. Therefore, this diet can play a part in postpartum care and complications.

It is also important for health care providers to assess health disparities and intervene where possible. This can mean providing information on resources to help with meals and transportation (such as Church Health; Tennessee Women, Infants, and Children Services; Catholic Charities, Uber Health). Working with other providers such as Social Workers to help with solutions may also be helpful in making suggestions.

Conclusion

The topic of diet and preeclampsia was chosen because it held special relevance to us due to personal relations with people that had preeclampsia. We were pleased to find confirmation and recommendations for a Mediterranean diet as a healthy diet associated with reducing the incidence of preeclampsia. Implementing dietary changes based on this diet may significantly contribute to better health outcomes for those at risk.

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My Funny Bone Hurts: The Serious Benefits of Humor in Medicine

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Abstract

We've all heard the adage "laughter is the best medicine" and likely had experiences where we seemed to anecdotally support this theory. This article presents a literature review of several studies showing the physiological effects of laughter such as the endocrine and immune systems, heart rate, and pain threshold as well as on mental health. Further, discussion will include possible application for students and medical practitioners.

Keywords: laughter, cortisol, pain threshold, resilience, mental health

Introduction

"There is a reason for the phrase "comic relief". When suffering is great, there is a call for relief. Whatever we are nervous about or emotional over is where jokes come from. And yet, in a hospital, where people are suffering greatly, one wonders when humor is appropriate." (Adams, p. 14)

You've likely heard the phrase "laughter is the best medicine". Laughter is described as "rhythmic, often audible, contractions of the diaphragm and other parts of the respiratory system. It is a response to certain external or internal stimuli" (as cited in Yim, 2016, p. 244). We know that laughter can release tension, ease our fears, build comradery, forge memories, generally improve our day and alleviate stress. Stress, in and of itself, is not always maladaptive. It can occur in ways that motivate us (studying for that next exam) or protects us (fight-or-flight activation). Yin (2016) describes stress as "the psychological and physiological response to surroundings; […] to the break or change in physiological, physical, behavioral, and emotional equilibrium or the response to trying to maintain homeostasis in the face of various stimuli". According to one research team, "although a stress-induced increase in cortisol secretion is adaptive in the short-term, excessive or prolonged cortisol secretion may have crippling effects, both physically and psychologically (Hannibal & Bishop, 2014).

This article reviews published literature regarding the effects of laughter on physiological and mental health and the potential benefits not only to the patient but also the patient-healthcare team dynamic and provider resilience.

Effects of Laughter During Stress

When we experience physical or psychological stressors beyond fight-or-flight stage, the endocrine system stimulates the release of cortisol (Ulrich-Lay, Herman, 2016). Beyond regulating the body's stress response, cortisol also aids in regulating metabolism, blood glucose levels, blood pressure, and aids in suppressing inflammation. Because cortisol levels fluctuate throughout the day, it is also thought to play a role in controlling circadian rhythms (Cleveland Clinic, 2021).

Long-term increased cortisol levels may adversely affect all of these leading to weight-gain, increased HgA1c, hypertension, insomnia, depression, and decreased immune function. Cortisol targets receptors in many tissues, including cardiac and skeletal muscle, immune tissues, and other endocrine tissues. Being a steroidal hormone, cortisone effects glucose by inhibiting its use; it is anti-inflammatory, depresses antibody and white blood cell production which suppresses the immune system (Thau, et al. 2024. Table 18.8, p. 616). Further, "a prolonged or exaggerated stress response may perpetuate cortisol dysfunction, wide-spread inflammation, and pain" (Hannibal & Bishop, 2014).

Neuroendocrine and Neuroimmune Response to Laughter

Berk (et. Al. 2001) points out that cortisol itself is not specifically immunosuppressive. Cortisol is necessary for normal function of the immune system as it can influence helper T-cell cytokine production. However, long-term or chronic increased cortisol levels effect the immune system by suppressing antibody and white blood cell production. (Tau et al., 2024).

A meta-analysis by Kramer and Leito (2023) of 8 studies showed a significant reduction in cortisol levels by 31.9% ($p = < 0.01$) after some form of laughter intervention (video, spontaneous, or laughter therapy) as compared to the control group. Ko (et al., 2020) found similar results in their study of immigrant women in South Korea who underwent laughter therapy. Their study measured salivary cortisol (and three other factors discussed in next section). They found that there was a statistically significant decrease from the baseline after laughter therapy ($p = 0.003$) compared to the control group. They further found that this decrease remained after two weeks.

Berk (et al., 1989) studied neuroendocrine changes brought about by laughter. In their study, the experimental group watched a 60-minute humorous video. Their results showed that cortisol and dopac (the major catabolite of dopamine, epinephrine, growth hormone, and prolactin) decreased ($p = <0.0005$ and $p = 0.025$ respectively) while the control group remained unchanged over time.

In a subsequent study by Berk, the test group watched a 1-hour humorous video with blood samples before, during, immediately and 12 hours after the intervention. Their results showed an increase in natural killer cell activity ($p = < 0.01$), immunoglobulins G, A, and P ($p = < 0.02$, $p = < 0.01$, and $p = < 0.09$ respectively); leukocytes such as activated B cells, T cells and active cytotoxic T cells (all $p = <0.01$), with many of these lasting 12 hours after intervention (Berk, et.

Al., 2001). Bennet (et al., 2003) found that these increases positively correlated with the subject's self-scored humor response scale. "Subjects who scored greater than 25 on the humor response scale had increased immune function postintervention" ($p = < 0.037$).

Psychological Response to Laughter

In our post-COVID-19 world, healthcare workers have faced a dramatic increase in burnout and chronic fatigue due to the overwhelming stresses associated with a global pandemic. Dealing daily with exposure protocols, staffing and PPE shortage issues, as well as the added work stressors has led to a dramatic increase in burnout, chronic fatigue, and depression, "which can progress to post-traumatic stress disorder (PTSD)" which consequently increases suicidality rates (Awan, et. Al., 2022). According to Olfsen (et al., 2022), US healthcare workers have a 32% elevated risk of suicide with registered nurses having a 64% higher likelihood to commit suicide when compared to non-healthcare workers.

Dalvi-Garcia (et al., 2021) states that the etiology of depression is a neurochemical imbalance of dopamine and serotonin caused by persistently high levels of cortisol. Yim (2016) asserts that depression is a disease and the deficiency of these neurotransmitters may contribute to difficulties in maintaining healthy lifestyle habits. According to Hannibal, this cortisol induced deficiency, coupled with "exaggerated psychological responses (e.g., catastrophizing) following maladaptive cognitive appraisals of potential stressors as threatening may exacerbate cortisol secretion and facilitate the consolidation of fear-based memories of pain or non-pain related stressors" (Hannibal, et al., 2014). They continued, stating that finding appropriate coping and stress reduction mechanisms "may minimize cortisol secretion and prevent chronic, recurrent pain".

In a study of immigrant women in South Korea who underwent laughter therapy, Ko (et al., 2020) studied not only the cortisol levels but the acculturate stress (the stresses associated with being an immigrant), anxiety, and depression. The women in the study participated in twice-weekly laughter therapy sessions with outcomes measured immediately after and at two weeks post intervention. The post-test showed there was a statically significant decrease in all three parameters ($p = < 0.01$ for all) with the effects persisting at the two-week mark.

Increased cortisol levels from stress can interrupt normal sleep patterns (trouble falling asleep and/or staying asleep) which can lead to depression. According to John Hopkins (n.d.), "75% [of people with depression] have a hard time falling or staying asleep". This can lead to cyclical problem. Han (et al., 2017) found that laughter therapy alleviated depression and improved sleep of long-term care patients. In their study, patients participated in laughter therapy twice weekly for four weeks. Therapy protocol involved "singing funny songs, laughing for diversion, stretching, playing with hands and dance routines, laughing exercises, healthy clapping, and laughing aloud". Their findings showed that depression and sleep improved compared to the control. (both $p = < 0.001$) with laughter therapy combined with physical activities.

Physical Response to Laughter

Because laughter is not just an emotional response but a physical action, one has to question if there are physical benefits as well. The Mayo Clinic suggests beyond simply soothing tension and alleviating stress, laughter stimulates many organs. “Laughter enhances your intake of oxygen-rich air, stimulates your heart, lungs and muscles, and increases the endorphins that are released by your brain” (Mayo Clinic, 2023)

Bennet & Lengacher (2007) found the effect of laughter can lead to immediate increases in respiratory and heart rate as well as respiratory depth and oxygen consumption. “These increases are then followed by a period of muscle relaxation, with a corresponding decrease in heart rate, respirator rate, and blood pressure.” Hayashi (et al., 2016) found that the frequency of laughter played a role in the prevalence of cardiovascular disease and stroke. Participants who reported laughing every day was lower than those who “never or almost never” laughed.

Additionally, Buchowski (et al., 2007) found that genuine laughter (as opposed to forced, non-emotional laughter) increased the energy expenditure and heart rate above resting values, “which means that 10-15 minutes of laughter per day could increase total [calories burned] by 10-40 kcal.”

Pain Tolerance Response to Laughter

As discussed earlier prolonged stress can lead to “cortisol dysfunction, wide-spread inflammation, and pain” (Hannibal & Bishop, 2014). Further, they found, “a pain-induced stress response is elicited by a magnified perception of pain as threatening or dangerous […] and often manifests as fear and avoidance of pain-provoking stimuli”. As future healthcare professionals, there will be many instances where we must perform a procedure that is painful, and more times where the patient simply FEARS it will be painful. Pain, and the fear of pain, causes increased stress. This can not only interfere with the procedure in question but also increase avoidance of future health-care interventions.

According to Columbia University Medical Center (2013), “science shows many people develop fear after experience sudden, serious health scares. Their fear becomes an obstacle to changing habits that may have led to the health scare”. This is also true for people who have had painful experiences with previous healthcare interventions. Some patients will become less complaint with their health care, missing appointments, skipping or misusing medications, etc. The severity of the event doesn’t necessarily correspond with the severity of the fear response (up to and including the development of PTSD) (Columbia, 2013).

Studies have shown that laughter not only “induces a positive attitude in the observer, thereby facilitating interaction by reducing threat” (as cited in Dunbar, et al., 2011) but effects pain thresholds (Dunbar, et al., 2011; Emali & Akpinar, 2017). Because pain increases stress, which can serve to increase pain, pain control is important. However pharmacological control of pain comes with many side-effects, precautions and contraindications, as well as potential economic

burden to the patient (Emali & Akpinar, 2017). Laughter is freely available, does not interact with other medications, doesn't require specialized equipment or locations, and can be 'administered' by anyone. This makes it not only economical but an ideal adjunct therapy for pain control.

Dunbar (et al., 2011) found laughter to have an analgesic effect. They found that their participants who watched a funny video experienced an increase in their pain tolerance ($p = < 0.024$) over the control. They further examined whether the change was due to laughter or to change in affect alone. They stated, "laughter can be differentiated from positive affect per se in its effect on pain threshold, even though laughter may enhance (or be correlated with) enhanced positive affect" ($p = < 0.016$). They postulate that these results are likely due to endorphins released during laughter.

Practice and Application (for Students and Professionals)

Patch Adams, MD has said "Research in mind-body-spirit medicine […] confirms the biochemistry and physiology that supports what poets, artists, mystics, and fools have always known – that love, compassion, humor, empathy, tenderness, faith, touch, creativity, and service all help people feel better" (Adams, p. 90). Having spent many years in allied-health and serving as a Combat Medic in the United States Army, I have seen first-hand the effects a shared laugh can have on the patients' experience and the coping abilities of my fellow service members.

In the academia, we have (or will have) interactions with instructors, cohorts, and eventually patients from a vast variety of cultures, experiences, and backgrounds. School itself is a major stressor that adds various layers of additional pressure to a student's life. Laughter shared between faculty, cohorts, and health care workers can decrease stress, increase comradery, as well as provide a much-needed avenue for decompression and processing after difficult interactions (Garratt, 2023). Brandon (et al., 2017) suggests that while humor and laughter may not directly cause learning "humor improves student performance by attracting and sustaining attention, reducing anxiety, enhancing participation, and increasing motivation" in addition to its stress relieving properties.

Booth-Butterfield (et al., 2007) found that those who are able to find the humorous aspect of a problem or situation are better able to cope with the stress of both school and healthcare work. They further conclude that the use of humor in academia as well as the work force not only promotes learning but helps to develop more constructive relationships. These relationships can be crucial in the medical field where life, trauma, and death are part of our every day. Health care workers tend to compartmentalize the negative aspects of their work when talking with family and non-coworkers. This can lead to isolation and adverse mental health outcomes. Having even informal support from coworkers helps to provide an outlet where difficult situations can be discussed openly and be processed in a healthy manner (Garratt, 2023).

However, like any prescribed treatment or medication, we must remember to always use humor appropriately and in proper moderation. Borins (1995) cautions, "[…] the therapeutic alliance and positive-transference relationship can be damaged if a patient feels the physician is laughing at him rather than with him". Louie (et al. 2016) cautions that "humor delivered at inappropriate times can be devastating, insensitive, and crass".

Appropriateness

We can all identify various types of humor and typically have specific genres that we find ourselves participating in during times of stress. There is uplifting humor (seeing the negative as positive, lifting up rather than putting something down), self-depreciating humor (making jokes about your own errors), and gallows or dark humor (making light of a difficult event or situation). The problem begins when we not only use but become comfortable with derogatory or cynical humor. This type of humor is intended to put down, dehumanize, or criticize another person. Berk (2009) says "negative humour exists, persists, and is justified as a way of coping with the stress, exhaustion and emotional difficulties of caring for persons who are ill or dying, patients who are demanding or manipulative, and patients who can't or won't follow medical advice". How could this ever be conducive toward building professional relationships with our patients and families?

Bluntly? The answer is… it can't. Using this derogatory/cynical humor among coworkers can be equally detrimental as it "erodes any sense of professionalism and civility in the clinical workplace" (Berk, 2009), rather than being a supportive mechanism that can mitigate the stressors of working in the medical field (Garratt, 2023). Berk (2009) further defines the use of this type of humor by medical professionals as "forms of verbal abuse, disrespect and dehumanization of their patients and themselves".

When applied appropriately, humor has the ability to "redraw the boundaries of the formalized doctor-patient-caregiver relationship. […] laughter and humour can entail, sustain, and/or unsettle power dynamics within the clinical structure" (Wainer, 2023) especially for our pediatric patients. In the typical hierarchy of modern medicine, the patient is often in a powerless and vulnerable position while the providers (at most levels of the medical eco system) have all of the perceived control in varying degrees. This is beginning to become a less frequent scenario with the proliferation of Interprofessional Collaboration and the inclusion of the patient and their family/support personnel in patient care decision and collaboration.

We should actively seek to build professional and therapeutic relationships with our patients and their care team, regardless of our place in the healthcare eco system. Patients and family members may be anxious, in pain, have a history of negative experiences surrounding healthcare, have social or religious conflicts, and may be genuinely distrustful. Louie et al. (2016) suggests that "laughter shared between the provider and patient conveys a measure of trust and light-heartedness. […] humor can improve communication".

Osencup (2020) suggests “the best ways to avoid pitfalls with humor is to start with yourself and your own experiences rather than trying to focus the humor on a patient or their situation”. He adds that humor should aim for positivity and inclusion and always follow the patients’ lead. If they are not receptive to humor, then don’t use it. While humor can help with patient-provider rapport, decrease stress, increase pain tolerance, and alleviate fears… as with any other treatment, it is not without risk.

Hardy (2020) cautions health care providers that while “humor has an important role in medical practice […] it is important to make sure that medical professionals are trained to use it reflectively, and in such a way that it does not lead to oppression or abuses of already vulnerable groups”. A little empathy can go a long way toward discerning whether humor may or may not be appropriate in the moment. But when it is, and when it’s reciprocated, a little humor goes even further.

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Ketamine in Major Depressive Disorder: Mechanism of Action, Efficacy, and Comparative Analysis with Conventional Antidepressants

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Abstract

Major depressive disorder (MDD) remains a leading cause of personal and health issues around the world, partly due to the delayed onset and incomplete efficacy of conventional antidepressants. This review synthesizes preclinical and clinical data on ketamine—a rapid-acting NMDA receptor antagonist—and compares its mechanism, efficacy, and onset with standard treatments. We first trace ketamine's evolution and history, then diving into its pharmacology: blockade of GluN1-2B-2D NMDA receptors, resultant glutamate surge, AMPA receptor activation, and downstream BDNF/mTOR-mediated synaptogenesis. In a comparative analysis of Hamilton Rating Scale for Depression (HRSD) outcomes, traditional agents (SSRIs, SNRIs, TCAs, MAOIs, NDRIs) show 10.4–15.1-point reductions over 7–28 days, whereas ketamine yields a 12-point decrease within 24 hours. Clinical studies of sub anesthetic ketamine (IV infusions of 0.1–0.75 mg/kg and intranasal ketamine) report rapid response and remission rates in treatment-resistant depression, with emerging applications in PTSD and anxiety. We also examine the roles of R- versus S-ketamine and the benefits of ketamine-assisted psychotherapy for sustaining therapeutic gains. Despite its promise, ketamine therapy poses challenges, including cost, transient cognitive effects, dissociation, and the need for repeat dosing. Regardless, ketamine exemplifies a shift toward glutamatergic modulation and rapid symptom relief, complementing existing antidepressant strategies and offering hope for patient's refractory to conventional treatments.

Ketamine as a Drug and its History

Ketamine is a dissociative anesthetic that is characterized by both its potency and efficacy — acting faster and producing stronger results than other antidepressants. It has shown wide usage in chronic pain, psychiatry, and emergency medicine. Inducing an euphoric state characterized by sedation, pain relief, memory loss, while also preserving airways and cardiovascular stability. However, due to the dissociative and hallucinogenic effects, ketamine is a Schedule III requiring medical supervision (for reference, cocaine is a Schedule II drug, and Xanax is a Schedule IIII drug).

In 1962, ketamine was first synthesized by renowned chemist Calvin Stevens, searching for a safer anesthetic with fewer hallucinogenic effects. First, being tested on animals, researchers discovered how effects wore off relatively fast compared to other prominent hallucinogens and did not significantly depress breathing or heart function. When tested on primates, subjects showed signs of agitation or confusion. Following extensive trials, ketamine emerged as a highly promising anesthetic, prompting researchers to investigate human trials. In 1965, professors Edward F. Domino and Guenter Corssen published the first results of human trials with ketamine. Taking prisoners from the Jackson State Prison in Michigan, researchers found that ketamine maintained vital signs and showed a decreased risk of death in patients. Later being approved by the FDA in 1970, ketamine was used widely during the Vietnam War for its rapid action and immediate pain relief. In the 1990s, researchers began to study ketamine's neurological and antidepressant potentials, focusing on NMDA receptor activity. In the early 2000s, a groundbreaking study by Berman et al. showed that a single dose of ketamine produced antidepressant effects in patients with major depressive disorder (MDD). Today, ketamine has become more widespread, being able to be taken in various forms, with ongoing research to refine its usage and long-term effects.

The Biology of Ketamine

Ketamine exists in three major forms, each distinguished by its molecular configuration and pharmacological effects. S – Ketamine has a higher affinity for NMDA receptors, the main site of ketamine's action in the brain. Because of this, S – Ketamine has a greater potency resulting in faster effects. The FDA- approved nasal spray known as Spravato uses this type of ketamine due to its rapid action, making it widely used where immediate symptom relief is crucial. On the other hand, R-Ketamine has a lower affinity for the NMDA receptor but has different characteristics, which differentiate it. Studies suggest that it has similar or potentially even better antidepressant effects compared to S-Ketamine without all the hallucinogenic side effects. Scientists are hoping that it will one day be able to treat neurodegenerative disorders. R-Ketamine does take much longer to use but shows greater neuroplasticity enhancement. Taking half of both types of ketamine, racemic ketamine is a 50/50 mixture of R and S isomers of ketamine. This is the most commonly used form in both clinical and anesthetic settings.

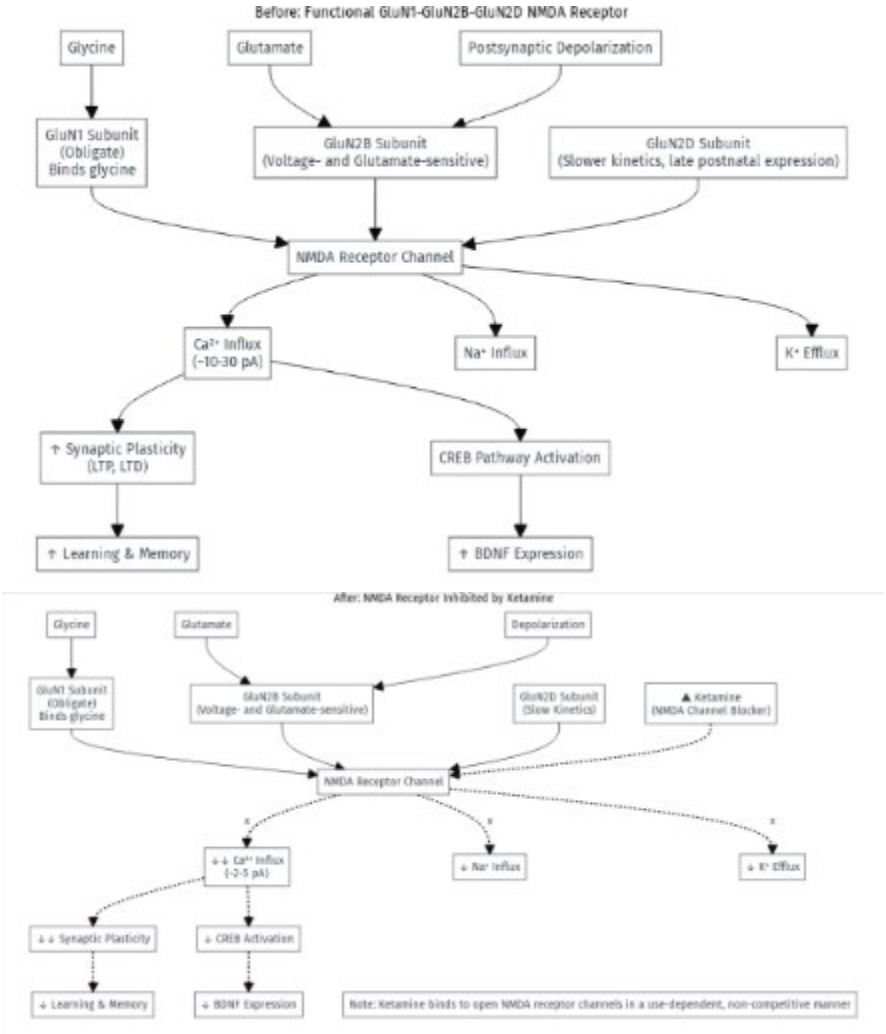
Ketamine's distinguishing characteristics derive from its effects on different specific areas in the brain. In the hippocampus, ketamine alters the processing of new information, contributing to rapid antidepressant impact. However, due to its effects within the hippocampus, researchers wonder if ketamine could potentially disturb short-term memory. In the prefrontal cortex, ketamine counteracts the dysfunction commonly seen in depression in that, rather than simply blocking NMDA receptors; it modulates the glutamate system, effectively rewiring the brain.

Ketamine's pharmacological abilities stem from its unique interaction with the glutamatergic system. Standard antidepressants elevate monoamine levels for example serotonin, dopamine, and norepinephrine, while ketamine acts as an antagonist to NMDA receptors. Ketamine disrupts

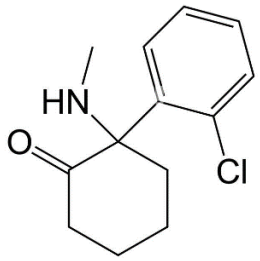
normal regulation of glutamate release by blocking its receptors, particularly the GluN1-2B-2D subtype, leading to a surge of extracellular glutamate in select brain regions. The rise in glutamate amplifies intercellular communication, creating ketamine's rapid therapeutic effects.

Ketamine stimulates another form of glutamate receptors: AMPA receptors. The activation of these receptors triggers intracellular events, which includes the release of the brain-derived neurotrophic factor (BDNF). BDNF is involved in synaptic growth and the formation of new neuronal connections. Additionally, ketamine activates the mTOR signaling cascade, a key component of synaptic plasticity. AMPA receptor stimulation and mTOR pathway activation create a reorganization of neuronal circuits. The combined effect of these receptors plays a crucial role in both the immediate and long-lasting antidepressant benefits of ketamine. Unlike conventional mood stabilizers, which regulate neurotransmitter levels, this mechanism directly facilitates structural changes within the brain, reshaping its neural pathways.

Recent breakthroughs using electron cryo-microscopy and neuroimaging techniques have shed light on the interactions underlying ketamine’s effects. Researchers Hiro Furukawa and Hyunook Kang at Cold Spring Harbor Laboratory (CSHL) found that ketamine binds to the GluN1-2B-2D NMDA receptor in multiple ways, effectively closing its ion channel and altering neuronal excitability. This binding mechanism cascade modulates both local synaptic activity and large-scale networks. One such network is the Default Mode Network (DMN). DMN disruption correlates with a reduction in maladaptive rumination and negative thought patterns. By editing these networks and promoting synaptic plasticity through AMPA-driven BDNF and mTOR pathways, ketamine offers a new perspective on rapidly reversing depressive states.



While ketamine's effect on NMDA receptors and the resulting glutamate surge reveal the brilliance behind ketamine's rapid antidepressant effects, they also underscore certain challenges. Changes in hippocampal activity can transiently affect memory formation, a subject that remains under active investigation. Ongoing research on optimizing dosing strategies might preserve the large therapeutic effects of ketamine while minimizing cognitive side effects.



Chemical Structure of Ketamine, showing the ketone functional group (in the form of cyclohexanone) and the secondary amine functional groups along with chlorobenzene.

Ketamine and Its Effects and Use on Depression

Ketamine, at lower, sub-anesthetic doses, has demonstrated remarkable efficacy in treating treatment-resistant depression (TRD). Ketamine is typically administered at 0.5 mg/kg over 40 minutes. Some patients benefit from as little as 0.1 mg/kg, while others may need up to 0.75 mg/kg.

Ketamine can also be administered nasally. The use of Spravato (ketamine nasal spray) has increased among patients with major depressive disorder. A study published in *CNS Spectrums*, a peer-reviewed journal in neuroscience and psychiatry, analyzed the effects of ketamine nasal spray on TRD patients. Under clinical supervision, patients received a fixed dose of 56 mg or 84 mg intranasally. Researchers found that 77.1% of Spravato patients experienced a clinically significant improvement.

A 2023 clinical trial published by Bio-K Research studied the effects of ketamine infusions on 74 individuals with TRD across four clinics. After just three infusions over 11 days, 52% of participants experienced remission of severe depression, while another 15% responded somewhat.

The National Survey on Drug Use and Health (NSDUH) found that recreational ketamine use among adults increased by 81.8% from 2015 to 2019, and by another 40% between 2021 and 2022. Adults with depression were 80% more likely to have used ketamine during the 2015–2019 period. Despite its clinical promise, ketamine use remains limited due to high treatment costs and insurance limitations. Insurance typically covers only Spravato, leaving many patients without affordable access.

Initially, patients are typically prescribed two infusions per week for the first 2–3 weeks. Following the initial treatments, ketamine therapy often transitions to once every two weeks or once a month. Some patients improve significantly within three to six months and are able to discontinue treatment.

While ketamine therapy offers fast-acting and transformative relief for individuals with treatment-resistant depression, it has its limitations. One major barrier is cost. Ketamine infusions can range from **$400 to $800 per session**, often requiring multiple sessions over time. Many patients face steep out-of-pocket expenses. This financial strain can make long-term treatment unsustainable for those who need it most.

Ketamine's dissociative effects raise safety concerns. Patients should be closely monitored during and after administration to ensure their safety and well-being. Long-term or frequent use may lead to cognitive disturbances or dependency. For individuals with a history of substance use disorders, this risk becomes even more significant.

Ketamine for PTSD: Emerging Studies and Clinical Applications

PTSD (Post-Traumatic Stress Disorder) is a chronic and disabling condition with limited effective treatment – most treatments have a delayed onset and limited efficacy. With over 35 million people who have this limiting condition, researchers continue to search for potential treatment for this stubborn disorder. In recent years, ketamine has been explored more and more as a potential solution.

Ketamine has been tested in many war veterans or children who experienced early trauma. Many war veterans suffer severe PTSD with everything they endure, and typical antidepressants often times can simply not adequately treat this. One of the most compelling aspects of ketamine is its ability to produce rapid antidepressant effects, sometimes even within hours and days. In addition, when tested, ketamine distinguished itself from typical PTSD "treatment," in that, it worked. When tested on French soldiers injured in Afghanistan, ketamine has reduced PTSD symptoms significantly compared to those who received other analgesics or antidepressants. Additionally, patients who received ketamine reported decreased psychiatric episodes, suggesting potential benefits in outpatient settings.

One specific case, on a 7-year-old boy who had severe PTSD, Reactive Attachment Disorder (RAD), and Disruptive Behavior Disorder (DBD), exhibited frequent, often multiple times per day, episodes of severe emotional and behavioral outbursts. His symptoms were so extreme that he needed to stay in a long-term residential care facility because of the unintentional dangers he posed. He had been treated with various antidepressants before, but many of them simply did not create a change, and if they did, they would simply come back later. When given 10 mg of ketamine, researchers noticed a dramatic reduction in aggressive behavior, improved emotional regulation, no physical restraints, and increased affection towards others. He was also able to speak openly to his therapists about his past trauma and abuse, something that he had never done before. This case ignited optimism regarding the use of ketamine as a treatment for PTSD, giving researchers a new star of hope.

In a randomized trial, researchers compared the results of ketamine to midazolam, a previous treatment for chronic PTSD. In a double blind, active-placebo randomized controlled trial, patients received a single dose of ketamine (0.5 mg/kg) or midazolam (0.045 mg/kg) infused over 40 minutes. A mixed model crossover analysis revealed a significant reduction in PTSD severity after 24 hours between ketamine and midazolam. Ketamine was additionally very well tolerated, only having temporary dissociation that quickly resolved with no serious psychotic or manic symptoms. This study highlights ketamine's potential to offer rapid relief, a critical need for individuals suffering severe and debilitating PTSD symptoms.

However, one potential issue with ketamine for PTSD is that the effect is often only temporary. In the case of the 7-year-old boy, these effects only lasted 14 days after ketamine was

administered, returning him back to his previous state. Military veterans who were administered ketamine reported rapid but only temporary relief. However, ketamine with psychotherapy techniques has shown sustained symptom improvement in some patients, in some cases, shown to be able to last around 4 months post-treatment. Researchers hope that with extended research of ketamine, they can achieve sustained symptom improvement for PTSD patients, potentially overcoming its temporary nature and offering a promising new pathway for PTSD patients.

Ketamine for Anxiety Treatment: Potential Benefits and Usage

Ketamine has gathered significant attention as a potential rapid-acting treatment for anxiety disorder, especially when traditional treatments have been ineffective. One of the most compelling benefits of ketamine is its speed. Unlike conventional antidepressants, which can take weeks to take effect, ketamine can create significant improvements in anxiety symptoms within hours, and in some cases, even minutes. Ketamine shows promise in individuals with treatment-resistant anxiety (TRA), where ketamine has been shown to provide significant relief. While the immediate effects are rapid, anxiety tends to be a disorder that often returns quickly. While the duration of these benefits did vary, some patients maintained benefits for several weeks, which is often much longer than other anxiety treatments. Ketamine does this by rewiring the brain’s neural connections, increasing neuroplasticity, which regulates thought patterns and removes negative thoughts from the brain. Researchers suggest that in the near future, the benefits of ketamine can be sustained for a much longer time with a series of infusions and potential maintenance therapy.

A systematic review in 2022 analyzed eighteen studies with 513 participants experiencing anxiety and found that while single-dose infusions weren't consistently effective, using ketamine doses weekly showed significant potential. Another analysis of randomized placebo-controlled trials found significant improvement in anxiety within 12-24 hours that lasted up to 2 weeks. Similarly, a small 2017 study found that 83% of participants with anxiety reported reduced anxiety symptoms within just hours of treatment. These studies collectively suggest that while single, acute doses of ketamine offer rapid, short relief, consistent dosages of ketamine can lead to sustained and strong benefits for anxiety. Ketamine has a lot of promise in anxiety treatment, particularly for its rapid effects, but further research is being conducted on dosage timing in hopes of achieving more lasting relief and effects.

Ketamine - Assisted Psychotherapy: Enhancing Therapeutic outcomes

There has been growing interest in combining ketamine with psychotherapy to potentially enhance treatment outcomes and prolong therapeutic effects. While ketamine is very fast, the effects only last a few weeks and do not persist for long. Scientists are hoping that combining ketamine and psychotherapy will lead to fast, yet prolonged, therapeutic benefits.

Through the different aspects of psychotherapy, ketamine can give new benefits while strengthening the effects it previously had. During the first preparation phase, psychotherapists set the stage for a more effective, safer, and impactful ketamine treatment. Preparation leads to reduced anxiety and resistance to treatment. When a patient is prepared, calm, and has clear intentions, their brain is in a better state to respond to ketamine's neuroplasticity effects. During the ketamine administration, psychotherapists give a feeling of security during dissociation in patients and help manage the emotional arousal that ketamine may bring. This helps to direct neuroplasticity, increasing the likelihood of these new neural pathways being formed. Ketamine offers a temporary reset for brain circuits involved in mood and thought, and guided psychotherapy ensures that this reset is used for constructive usage. During the final integration phase, psychotherapists help patients make sense of the experience – the dissociative state can be confusing or abstract, and this integration helps patients understand what they are feeling. Additionally, they can help prevent relapse and foster continuous growth, encouraging patients to continue reflecting and integrating anything new that they learn. While ketamine makes all the changes in the brain, psychotherapy transforms those changes into enduring personal growth and sustained well-being. This ensures that ketamine's rapid effects are not only strengthened but also extended, leading to profound changes and effects.

In a series of 17 studies, diagnoses addressed included PTSD, substance abuse, depression, anxiety, and various other mood disorders. With different methods and varying dosing regimens, psychotherapy has been administered before, during, and/or after ketamine sessions. Most studies reported positive outcomes, suggesting that this combination could prolong therapeutic effects. These findings suggest that psychotherapy is not merely a supplementary help; rather, it appears to be a critical component that helps prolong ketamine's effect into sustainable growth, guiding the brain's flexibility to long-lasting, positive change.

Summary of how other antidepressants work (stimulants etc.)

Standard antidepressants target the monoaminergic system, particularly the neurotransmitters serotonin (5-HT), norepinephrine (NE), and dopamine (DA). Monamers regulate mood, motivation, cognition, and arousal. Antidepressants aim to increase the synaptic availability of one or more of these monoamines, thereby enhancing neurotransmission in brain circuits associated with emotional regulation and cognitive function.

Standard treatment durations range from six to twelve months, and long-term therapy is frequently required, particularly in patients with recurrent or treatment-resistant depression.

Selective Serotonin Reuptake Inhibitors (SSRIs)

SSRIs are the most widely prescribed antidepressants and are typically considered the first treatment for major depressive disorders.

SSRIs prevent the reuptake of serotonin into the neuron. This leads to increased extracellular serotonin concentrations in brain regions implicated in mood and anxiety.

Common SSRIs include fluoxetine (Prozac), sertraline (Zoloft), escitalopram (Lexapro), citalopram (Celexa), and paroxetine (Paxil). These medications are effective for major depressive disorder, generalized anxiety disorder, obsessive-compulsive disorder, post-traumatic stress disorder, and panic disorder.

SSRIs have many side effects including nausea, diarrhea, sexual dysfunction, and insomnia. Many side effects may go away after the first few weeks of treatment.

Serotonin-Norepinephrine Reuptake Inhibitors (SNRIs)

SNRIs inhibit the reuptake of both serotonin and norepinephrine by blocking serotonin and the norepinephrine transporters. The inhibition of both neurotransmitters make SNRIs effective for patients with somatic or pain-related symptoms of depression.

Common SNRIs include venlafaxine (Effexor XR), desvenlafaxine (Pristq), and duloxetine (Cymbalta). These medications are used to treat MDD generalized anxiety disorder, chronic musculoskeletal pain, and neuropathic pain.

However, SNRIs can also cause side effects such as elevated blood pressure, insomnia, dry mouth, and sexual dysfunction.

Tricyclic Antidepressants (TCAs)

TCAs are among the earliest antidepressants developed and remain effective, though their use has declined due to their broad receptor binding profile and significant side effect burden.

TCAs inhibit the reuptake of serotonin norepinephrine, histamine (H1), muscarinic acetylcholine (M1), and alpha-1 adrenergic receptors. This non-selectivity leads to a wide range of side effects.

Examples of TCAs include amitriptyline, nortriptyline, imipramine, and clomipramine. TCAs are also prescribed for neuropathic pain, migraine prevention, nocturnal enuresis, and insomnia.

Common side effects include sedation, constipation, dry mouth, blurred vision, urinary retention, and weight gain.

Monoamine Oxidase Inhibitors (MAOIs)

MAOIs inhibit monoamine oxidase (MAO), the enzyme responsible for breaking down serotonin, norepinephrine, and dopamine. As a result, these neurotransmitters accumulate in the brain, enhancing monoaminergic transmission.

Common MAOIs include phenelzine (Nardil), tranylcypromine (Parnate). MAOIs are typically reserved for atypical depression or treatment-resistant cases.

Side effects include orthostatic hypotension, weight gain, sexual dysfunction, insomnia, and dietary restrictions, which limit their use in general practice.

Psychostimulants and Adjunctive Agents

In select cases, psychostimulants such as methylphenidate or modafinil are used adjunctively to manage treatment-resistant depression, particularly when symptoms include low energy, cognitive impairment, or excessive fatigue. These medications increase dopamine and norepinephrine levels and are not used as monotherapy but can enhance antidepressant response when used judiciously.

Limitations of Traditional Antidepressants

Standard antidepressant's Therapeutic effects often take several weeks to become noticeable. For patients with treatment-resistant depression, traditional monoaminergic antidepressants may offer limited relief, necessitating the development of new pharmacological strategies.

The Hamilton Rating Scale for Depression (HRSD) is a clinician-administered questionnaire used to assess the severity of depressive symptoms. It typically includes 17 items covering mood, insomnia, anxiety, weight loss, and other symptoms, with higher scores indicating more severe depression. It is widely used in clinical trials to measure treatment effectiveness.

Drug	Class	Baseline HRSD	Endpoint HRSD	HRSD Change	Onset Time (days)
Fluoxetine	SSRI	24.5	10.0	14.5	21–28
Sertraline	SSRI	23.0	9.5	13.5	14–21
Escitalopram	SSRI	22.8	8.7	14.1	14–21
Citalopram	SSRI	23.2	9.8	13.4	14–28
Paroxetine	SSRI	24.0	10.3	13.7	14–21
Venlafaxine	SNRI	22.2	11.8	10.4	14–21
Desvenlafaxine	SNRI	22.0	11.0	11.0	14–21
Duloxetine	SNRI	21.5	10.0	11.5	7–14
Bupropion	NDRI	27.3	12.2	15.1	14–21
Imipramine	TCA	25.1	12.6	12.5	14–28
Amitriptyline	TCA	24.8	12.4	12.4	14–21
Nortriptyline	TCA	23.9	11.9	12.0	14–21
Clomipramine	TCA	24.5	12.2	12.3	14–28
Phenelzine	MAOI	23.6	11.8	11.8	14–21
Tranylcypromine	MAOI	24.0	12.0	12.0	14–21
Ketamine (24h)	NMDA Antagonist	26.0	14.0	12.0	**<1 (within hours)**

The dataset reveals a compelling contrast between the speed and efficacy of ketamine and that of traditional antidepressants. Conventional treatments, including SSRIs, SNRIs, TCAs, MAOIs, and NDRIs, reductions in HRSD scores ranging from 10.4 to 15.1 points but consistently require 7 to 28 days to take effect. Bupropion leads in overall symptom reduction (15.1 points), with SSRIs like Escitalopram and Fluoxetine close behind, yet all follow a similar multi-week onset pattern.

What sets ketamine apart is not just its efficacy, producing a 12-point reduction in HRSD scores—but the fact that this improvement occurs within just 24 hours. While its overall reduction is comparable to traditional medications, the rapid onset is unique in the dataset. No other treatment achieves clinically meaningful symptom relief within such a short timeframe.

Despite the varied mechanisms of action among traditional antidepressants, their therapeutic timelines remain remarkably consistent. Ketamine, however, diverges from this pattern, offering

a fast-acting alternative that stands out in both clinical effect and timing. This distinction makes ketamine an especially noteworthy option in contexts where time to response is critical, and where the limitations of delayed-onset treatments are most apparent.

Future Directions and Research
Ongoing studies on ketamine's long-term impact
The potential for mainstream medical adoption

Ketamine’s rapid onset and unique mechanism of action mark a profound shift in how we approach treatment resistant depression and related conditions. Whereas traditional antidepressants rely on gradually adjusting levels of serotonin, norepinephrine and dopamine over several weeks, ketamine immediately blocks NMDA receptors. This blockade unleashes a wave of glutamate, which in turn activates AMPA receptors. Downstream cascades involving brain-derived neurotrophic factors and the mTOR signaling pathway then spur the growth of new synaptic connections. It is this burst of synaptogenesis that underlies the remarkable twelve point drop in Hamilton Rating Scale for Depression scores seen within twenty-four hours of a single infusion—efficacy that matches or exceeds that of standard treatments but unfolds in a fraction of the time.

In clinical practice, sub anesthetic ketamine infusions at doses ranging from 0.1 to 0.75 milligrams per kilogram administered over forty minutes and intranasal esketamine protocols have demonstrated robust response and remission rates for people who have exhausted conventional options. Beyond major depressive disorder, early evidence points to benefits in post-traumatic stress disorder and anxiety disorders. The racemic mixture of ketamine continues to serve both anesthetic and off label psychiatric purposes, while the S enantiomer has achieved FDA approval under the name Spravato. Researchers are now exploring R enantiomer formulations in hopes of further reducing side effects and enhancing neuroplasticity changes.

Despite these advances, ketamine therapy is not without challenges. The cost of treatment and the need for specialized monitoring create barriers to access. Some patients experience brief episodes of dissociation or cognitive fog during and immediately following administration. Maintaining therapeutic gains often requires repeated sessions or ongoing booster treatments, raising questions about optimal maintenance strategies and long-term safety. Integrating structured psychotherapeutic interventions with pharmacological dosing shows promise in extending the window of relief and fostering lasting behavioral and emotional change.

Looking ahead, refining ketamine treatment will involve personalizing dosing schedules, developing reliable biomarkers to predict who will benefit most and establishing protocols that balance efficacy with safety. Efforts to train clinicians in administering and monitoring ketamine are essential to broaden its availability. As new delivery methods and combination approaches emerge, ketamine stands as both proof of concept and practical tool. It highlights the power of

targeting glutamate systems to unlock rapid synaptic repair and offers genuine hope for patients whose lives have been shadowed by courses of depression that failed to respond to anything else.

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Synapse

The Shift of the Stethoscope

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One of the most recognizable symbols of medicine is embodied in the stethoscope. From the advent of the first stethoscope by Dr. René-Théophile Hyacinthe Laennec in 1816 to listen to the heart through a wooden tube, it has transcended the field of medicine [1]. The etiology of the word comes from Greek nomenclature, *stethos,* which indicates chest, and *skopei,* meaning to explore [2]. It has certainly exceeded those expectations. The modern stethoscope allows clinicians to gather useful data, such as heart murmurs and lung sounds which guide them towards clinical diagnoses and treatment plans. It serves as a key instrument for every clinician, and more importantly, it conveys trust in the eyes of the patient. For some who were drawn to medicine as children, many of them can remember playing with a stethoscope and practicing on their family members, sparking their curiosity and fascination to help others. In the modern age, however, the advent of new digital practices has shifted the meaning of the stethoscope. New information through laboratory testing, high-resolution & point-of-care imaging, along with other analytical-driven data is available at the fingertips of clinicians within minutes. These advancements certainly paint the picture of the changing role of the stethoscope and inherently medicine itself. It is no longer the most important tool for a physician, but rather symbolic in nature. This dynamic shift underlies a bigger dilemma in medicine: how has the art of clinical medicine changed itself?

The bedside examination is one of the most vital elements of a patient-physician encounter. It allows physicians to establish rapport with the patient and gather essential clinical observations to guide clinical care while simultaneously conveying attentiveness to the patient's concerns. It adds an element of calmness and trust to the patient who feels a sense of relief as they are stepping towards a healing process, a key tenet of the physician's commitment to providing compassionate and quality care. The stethoscope serves as a key turning point in the evolution of the bedside exam, allowing an encounter to be continued through the act of listening, hoping to catch an abnormal heart murmur or the sounds of rales, which could be indicative of interstitial lung disease. This paradigm has since shifted in the modern day. Through a personal clinic experience working as a medical scribe, I was able to observe this firsthand. Through my countless encounters with various physicians and other advanced practice providers (APPs), I noticed the subtle differences in the art of the physical exam. Many of the older physicians and APPs performed much more extensive physical examinations, such as carefully percussing the patient's back to check for areas of dullness in assessing fluid, or a more thorough listen to the heart vasculature to diagnose. In contrast, I observed many younger providers performing a more mainstream examination, including listening to lung fields in primary locations to follow a more streamlined approach and using technology to aid their diagnosis. Neither approach was superior to the other; rather, the significance came in the details. This simple observation demonstrated

the differences in the clinical era of medical training and the adaptive practice of medicine. Tools such as CT imaging, radiography, laboratory work and diagnostic testing clearly support the shift towards the technological turn in medicine. These modalities have become so fundamental in clinical diagnosis. Abnormalities in lung sounds such as crackles could be indicative of pulmonary edema, but this could certainly be confirmed via chest radiography. Abnormal heart sounds could suggest various regurgitation disorders but could be much more precisely ascertained via echocardiography. These advancements have certainly progressed the field of medicine towards more efficient and accurate clinical diagnoses, but at what cost? A fundamental practice of the art of the physical exam itself is lost.

While all clinicians are highly trained in the physical examination, overreliance on technology has likely atrophied years of clinical skills that used to serve as the fundamental components of the patient encounter. It is important to consider what may have caused this shift. The increased patient load diminishes time for the patient-physician encounter and, in essence, the detailed physical exam. Or it could be because of the differences in our training models in the new age of clinical medicine. Take W. Proctor Harvey, MD, who educated his students on clinical auscultation using Beethoven's Symphony No. 9 to better grasp different heart sounds [3]. This practice of combining bedside medicine with musical models is likely lost in a technology-driven area where we have stethoscopes which include various amplification powers and can be connected electronically to view waveforms on a digital device at bedside. This generational shift is certainly aided by the advent of new technology in medicine, which continues to progress. A more recent example is the COVID-19 pandemic, in which telemedicine was introduced and has since persisted, allowing patients to be seen and evaluated even without a physician laying a hand on the patient to perform the physical exam. Regardless, my simple observation underpins a much larger issue at hand. This shift causes a loss in the true meaning of the patient-physician encounter and the ritual of care through careful evaluation of our patient, such as looking for subtle clinical signs and ultimately putting a human to a chart.

As a first-year medical student, I urge my colleagues entering the field of medicine to be cognizant of this momentous shift. The white coats and stethoscopes with which we were donned signify much more than just the physical attributes - they resemble compassion, connection, and responsibility we have as future physicians for our patients. The future of medicine will undoubtedly continue to grow with new technological advancements, allowing us to become better clinicians. We must, however, continue to remain grounded in our clinical practice to treat the patient, not an obsolete image or data point. The best clinicians will be those who embrace this new age but continue to remain rooted in values central to the human connection. Technology should not be a crutch, but rather an aid in our clinical practice. The stethoscope has inherently obtained a new meaning, not by choice, but rather by the evolving door of physicians before us who have set the groundwork for where we are now. To make the stethoscope obsolete now would be foolish, but to uphold its legacy while integrating the innovations of clinical medicine will ensure we honor both science and healing.

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Synapse

Learning Through Service: A Reflection on Cultural Immersion

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I have been translating for my family members for as long as I can remember. Whether my grandma was shopping at Macy's, or my mom needed help remembering a word at the doctor's office, I was always using both of my languages to facilitate communication. When I was younger, I didn't think about it much; it was second nature for me to ask if anyone needed an interpreter to-go. It wasn't until I got older that I realized I was helping fill a gap that I didn't know existed. I also didn't realize the importance of the skills I had been honing with my own family until I began taking classes on the value of culture in healthcare.

My knowledge of these skills began in the classroom my freshman year when I took a class called Intercultural Communication. This class was centered around educating students on different cultures and the importance of using this knowledge in their future careers. I remember watching the lectures and reading the PowerPoints thinking to myself, "Doesn't everyone know this stuff?". It wasn't until halfway through the class that I realized not everyone has juggled two different cultures before. I had life experiences that not many others in my class could relate to and I had been practicing intercultural communication without knowing it.

Once that class opened my eyes, I actively chose to take more classes relating to cultural competency because my culture isn't the only one that exists. The year after I took Intercultural Communication, I enrolled in Biomedical Ethics and Values. In this class we discussed different ethical situations involving people with different cultures and beliefs. Every week we focused on a different culture and their specific beliefs on medicine, healthcare, and different treatments. This class was especially helpful for me because I learned about many new cultures. A specific example I remember from class is learning about how the Jewish religion believes life doesn't start until the baby takes its first breath, meaning they are not opposed to abortion. I remember this was shocking to me, especially because of Christianity's views on abortion and how these two are very interconnected. It was nice to have a class where I was learning completely new and applicable things.

However, learning about different cultures is one thing but putting them to practice is a completely different ball game. I knew immediately after taking Intercultural Communication that I needed to make myself uncomfortable; I had to immerse myself into a culture different from mine. So, I applied for the medical mission trip to Peru the trimester after. It was an opportunity for me to apply what I had learned while also using my most important skill: my native language. I prepared for my trip by researching the culture and their traditions, as well as reviewing some Spanish medical terms that I tend to forget.

This trip consolidated all the information I had learned in Intercultural Communication into practice. Not only was I consciously respectful to their culture, but I was asking questions, eating their food, and engaging in their traditions. On our last clinic day, we travelled to an indigenous community in the jungle of Peru, and they bid us farewell with one of their traditional dances. The women even pulled some of us in to participate, and I was one of the lucky few. Although it was hot, humid, and we had just worked a 9-hour clinic, I held hands and danced with them as we laughed. I had helped tear down the language barrier between our care team and the people we were serving and was ending the day with a backpack full of gifts and a godson. It was one of the most rewarding experiences of my life and it truly opened my eyes to the beauty of intercultural connection.

The two main coordinators for the trip were a South African man and a British woman. They took us, a group of Americans, all the way to Peru where we stayed in a volunteer lodge that was taken care of by an American, but you couldn't tell by the way he lived, dressed, and talked. He was so deeply connected to the Peruvian culture, that it became completely his own. He was married and had children, but he had found a different kind of family in the people and the culture of Peru. I felt a strong connection to his work, as I'm sure many of my peers who went on the trip did.

Because of this strong connection, I decided to continue my service learning at home in my own community. When I got back from my mission trip, I began volunteering with the Baptist Women's and Children's Hospital where I helped in various areas. The service I help with the most is child life and supporting families with admitted children, whether playing with their kids or getting them lunch. Because of the many different cultural groups in Memphis, I interact with people of various backgrounds daily. However, there is one common thread I see in all of them: their overwhelming love and concern for their children. Parents will exhaust themselves by caring for their children when they're sick in the hospital and being able to relieve them is a beautiful gift.

Volunteering at the hospital has allowed me to use my skills in a way that doesn't focus on the clinical aspect, but rather on connection. I get to care for the parents' children and entertain or play with them for likely the first time during their hospital stay. No matter what language they speak or what culture they come from, they all recognize empathy. Most importantly, they all appreciate it. Communication is more than just talking to each other; it's about actions and body language as well. That is the biggest takeaway I have from my service-learning experiences; Even though we all come from different places, we value the same efforts when it comes to healthcare.

I've discussed my own experiences with service-based cultural education, but why is it important for all students going into healthcare to learn about different cultures? Well, there are copious amounts of literature supporting cultural competency in healthcare across different departments and for different areas of healthcare. In fact, educating medical and healthcare students for better cultural competency has proven to increase their confidence, learning satisfaction, and ultimately serve as a positive reinforcement (Walkowska, 2023). Multiple studies and research articles exist regarding intercultural communication and competency, and most of them support the need for further education.

In fact, a study that compiled survey answers from practicing physicians highlighted a lack of education on systemic issues in healthcare such as racism, power imbalances, and culture biases

(Shepherd, 2019). Despite the progress made in the last few years, exposure to different cultures is still an area to be worked upon. As our country continues to attract a more diverse population, our physicians, nurses, and healthcare system must learn to adapt and care for all patients. Teaching our future healthcare workers how to effectively communicate and care through a language barrier is also crucial. There is an obvious necessity for more systematic support and diversity sensitivity training as is highlighted by multiple other studies (Schouten, 2023). However, change begins on an individual level, and we can all put in the effort to educate ourselves and treat our patients with equal diligence.

In conclusion, it's crucial for healthcare students to learn how to treat patients from various cultures with respect for their beliefs and traditions. This begins with learning about different cultural groups and what makes them different from our own, which is typically done in a classroom setting. After learning how to communicate tactfully, we need to learn how to consolidate the information and put our skills to work in real world situations. This starts with stepping out of our comfort zone and immersing ourselves in a situation where we interact with many different groups of people, whether close to home or two plane rides away. Finally, it is our duty to remain open to learning as we work in our respective fields, and this includes being wrong sometimes. Fixing our mistakes and striving to be better next time will allow us to provide equitable quality care across different cultural divides. Everyone deserves to feel respected and understood when seeking medical care. Putting yourself in someone else's shoes starts with acknowledging your differences and caring for them despite them.

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