Faculty Forum President’s Letter

Since arriving in 1998, I’ve witnessed nothing less than a Research Renaissance at Union University. A number of factors have contributed to this Renaissance: professional development funds which would be the envy of many professors at large research universities, a program of research leave opportunities which supports up to four professors per year, and a thriving community of scholar-teachers. While we should always be moving forward and improving even on these measures, in the past several years Union has taken great strides to demonstrate that religio et eruditio is more than a motto.

It is my distinct pleasure as Faculty Forum President to welcome readers to the Fall 2011 Journal of the Union Faculty Forum—a publication featuring a small portion of the fruits of this Renaissance.

In the Gospel of Mark chapter 12, Jesus is asked, “Of all the commandments, which is the most important?” He replies by quoting the shema, one of the most vital texts of the Jewish people, recited every morning and evening: “You shall love the Lord your God with all your heart, and with all your soul, and with all your mind, and with all your strength: this is the first commandment.” The submissions in this journal testify to a faculty committed to carrying out this commandment by developing God’s intellectual and creative gifts given to us.

Thanks to Forum officers Terry Weaver (VP) and Georg Pingen (Secretary) for their good work this year. A special thanks to JUFF editor Janna Chance for her yeoman’s effort in bringing this work to print. Readers, rejoice and enjoy!

—Gavin T. Richardson
A Word from the Editor

Returning to the *Journal of the Union Faculty Forum* editorship after a year’s hiatus for maternity leave, I have found my task as rewarding and challenging as before. Most of the rewards and challenges of editing the *JUFF* stem from its incredible range of material. This year’s articles come from the varied disciplines of art, English, history, mathematics, and nursing. Union University’s growing nursing program is particularly well represented in this year’s volume; the final three articles of this year’s *JUFF* all come from that discipline.

Besides its breadth, *JUFF*’s other distinctive feature is its commitment to integrating Christian faith and scholarship. Although issues of faith always appear in *JUFF*, Union University’s Christian mission comes across particularly clearly in this year’s volume. Of the seven articles included here, five explicitly tackle issues of faith. Coming out of the field of nursing, a discipline committed to caring for others, the other two articles bear a powerful but implicit Christian witness.

This thirty-first volume of *JUFF* would not have been possible without the hard work of many people. Please join me in thanking the Provost’s Office for funding and University Communications for printing *JUFF*. Although many people in University Communications have assisted with this document, I particularly want to thank Sarah Belcher for helping me assemble *JUFF* and work out last-minute formatting problems. I am also indebted to my student worker Elaura Highfield, who helped me proofread this year’s articles, and my husband, Nathan Chance, who provided the extra childcare I needed to complete this project. Finally, I wish to thank this year’s *JUFF* contributors for generously sharing their work with all of us.

—Janna Chance
# Table of Contents

Faculty Forum President’s Letter........................................................................................................... i  
*Gavin T. Richardson*

A Word from the Editor.............................................................................................................................. ii  
*Janna Chance*

An Education .............................................................................................................................................. 1  
*Melinda Posey*

Not Ideas about the Thing but the Thing Itself...................................................................................... 5  
*Jason Crawford*

Converted, Sanctified, and Called to Preach: Elizabeth—Early Nineteenth-Century  
Black Holy Woman.................................................................................................................................. 9  
*Judy Bussell LeForge*

C. S. Lewis and the Lion Mathematics.................................................................................................... 20  
*Matt D. Lunsford*

Patient Scheduled for Laparoscopic Cholecystectomy with Family History of Malignant  
Hyperthermia and Definitive Diagnosis of Carcinoid Syndrome: Case Report.......................... 32  
*April Yearwood*

Health Care Providers' Perceptions of Quality of Care: Spiritual Interventions and Medical  
Missions................................................................................................................................................. 39  
*Shari D. Wherry and Brad Harrell*

Identifying the Association Among Risk Factors and Mortality in Trauma Patients with  
Intra-Abdominal Hypertension and Abdominal Compartment Syndrome................................. 52  
*Brad Harrell and Sheila D. Melander*

Contributors ............................................................................................................................................... 64
According to The Pew Research Center for the People & the Press, only three percent of Americans are knowledgeable concerning foreign politics. This body of work presents these conflicts through the use of familiar educational iconography and materials that work together to transform the gallery into a classroom of a different sort. The collages utilize illustrations from 1950s educational primers that interact with modern day images of war, while playing upon the original format of letter cards. These characters cause the viewer to become more involved with the subject because they recognize the imagery involved in the scene. It has been found that American audiences due to their insular worldview do not respond with the sympathy needed for action to news concerning foreign politics unless the story predominantly features an element in which the audience recognizes their familiar. Each of these works is soaked in encaustic (beeswax) to perform the role of preservation. Just as wax is used in a hive to build walls – creating order out of chaos, wax allows us to examine what we need to learn in order to pray and assist. In the sculpture, titled the “The Peace Desk” the viewer is encouraged to perform the active role of prayer. This desk, while harkening to infamous tables where peace treaties are initiated, also functions as a repository for prayers, similar to the Wailing Wall or the collection of graffiti on the Berlin Wall. While once ordinary in function, these objects become extraordinary due of their witness and act as a reliquary of marks/prayers made in the hope of peace. This final sculpture provides the viewer with the chance to pray and make a mark for peace.

Note on compositions: Each one of these letters is accompanied by a news brief concerning the country. The pieces are composed of vintage letter cards, AP photos pulled from the country, Dick and Jane images from elementary vintage primers, and embroidery. The entire piece is covered with wax encaustic and measures 11.5×14.
Aa

Bb

Cc
To see the entire collection, A-Z, go to melindaecckley.wordpress.com.
Not Ideas about the Thing but the Thing Itself

By Jason Crawford

I

Louis Agassiz (1807-1873) was a Swiss naturalist who made a career for some years at Harvard and whose name still pops up all over the place: on various structures, streets, and neighborhoods around Cambridge, MA; on natural formations in Arizona, California, the deep geological past, the Moon, and Mars; and in the scientific classifications of various species, such as Gopherus agassizii, the desert tortoise. He was an early theorist of the ice age and a towering figure in ichthyology and natural history. And he inspired some strange and bodacious doggerel verse, including Longfellow’s “The fiftieth birthday of Agassiz” – “It was fifty years ago / In the pleasant month of May, / In the beautiful Pays de Vaud, / A child in its cradle lay” – and these rousing measures from Oliver Wendell Holmes: “How will her realm be darkened, losing thee, / Her darling, whom we call our AGASSIZ!”

One of Agassiz’s most accomplished students, the paleontologist Nathaniel Shaler, writes about the first days of his apprenticeship in Agassiz’s laboratory. On his arrival at the laboratory, Shaler was assigned to his post, a small wooden table with a tin pan on it. When he had satuated himself there, Agassiz brought a small fish, placed it in the pan, and gave Shaler his orders. They were look at the specimen; do not damage the specimen; do not talk with anyone about the specimen; do not read anything about the specimen. “When I think that you have done the work,” Agassiz said, “I will question you.”

After about an hour, Shaler was done with the fish: weary of its alcohol smell, and satisfied that he had learned what there was to learn about it. But Agassiz, though he was never far off, said nothing at the end of that hour, and indeed nothing, aside from a daily “good morning!” until Shaler had been at the fish for seven long days. Shaler, in the course of those days, astonished himself with what he saw and learned “a hundred times as much as seemed possible at the start,” he says, detail after detail about scales, teeth, order, structure. Finally, on the seventh day, Agassiz spoke – “well?” – and for an hour Shaler disgorged his findings as Agassiz sat on the edge of the table and puffed his cigar. At the end of the hour, Agassiz replied, “that’s not right” and swooped away, and Shaler understood that his teacher was testing him. He spent another full week at the fish and astonished himself again with the results. This time Agassiz approved, and he expressed his approval by presenting Shaler with a new task: a pile of fish bones and the admonition, “see what you can make of them.” Shaler set out–again with no help from Agassiz but the occasional “that’s not right”—to reconstruct the bones into the different skeletal fish from which they had come. The task took two months of determined labor.

It’s no surprise that Nathaniel Shaler dates his life as a naturalist from these first encounters with the man who went on to become his close friend and mentor. Nor was he alone. The landscape of zoology and natural history at the turn of the twentieth century was thick with distinguished students of Louis Agassiz. One of them, Samuel Hubbard Scudder, sums up the teaching of his master in a single, simple, indispensable injunction: “look, look, look.” When Scudder, after much labor, delights Agassiz by discovering the crucial fact about the first fish, he
counts the task done and asks what he should do next. The teacher responds, “Oh, look at your fish.”

II

I have my own “look at your fish” story, minus the inspiringly eccentric mentor and the fish. In a course I took my first year of graduate school, we were required to visit the Fogg Art Museum and to spend an extended time looking at one painting, Nicholas Poussin’s The Birth of Bacchus. I looked at the painting in four sessions of about an hour each. After each session, I went home and recorded in as much detail as I could what I had seen and experienced. I brought no companions, no writing implements, and no other distractions into these sessions. I did not look at reproductions of the painting between sessions. I did not read anything about the painting or its artist. I allowed my perceptions only what they could gather from the canvas itself. I was sufficiently astonished and perplexed by this experiment that, after I had done with Poussin, I tried the experiment again, with one of Jackson Pollock’s drip paintings. Five hours in four sessions, again with nothing to guide my looking but the paint on the canvas.

I have recently dug up the notes I took after each of these sessions. These notes reflect the perplexity of a mind trying to find a place to land, trying to converse with an object that slowly, very slowly, unfolds itself even as it remains stubbornly and suggestively mute. Here I am in the second, the third, the fourth hour with Poussin, discovering details and designs I cannot believe I did not see before. Here I am in my first hour with Pollock, recognizing that I see his painting with the eyes I developed to see Poussin. Here I am struggling for hours more to unlearn that foreign way of looking, to submit to Pollock’s own visual grammar. Here I am contending with the pictorial forms that implacably rise up from Pollock’s splotches and swirls: a long, thin, creaky man; a powerful swooping crawfish of beige; the looming hulk of a tree; a bottomless black congregation of nerves. Here I am–again and again, in the record of these notes–exhausted and restless, contriving every way I can of teasing the canvas before me into a fresh disclosure of its secrets. I look from the right, from the left (Poussin’s painting, I conclude, particularly invites a look from the left), from down below, from very far off, from very close up. I cut out little paintings within the paintings and wonder whether they have visual coherence. Rather late in my sojourn with Pollock, weary with my meditations, I decide to establish exactly how many paints he has applied, in what order, and in how many sessions. After much labor, I answer with assurance: seven paints, in such and such an order and in so many sessions. I astonish myself, later, with the discovery of an eighth color, a blue-gray drizzle that has eluded my notice for hours and that now seems crucial to the success of the whole painting. I find lodged in the paint a pebble, which I often return to and which I come to regard as mine and Jackson Pollock’s little secret. I long ardently for more Pollocks to look at, for visual conversation partners, anything to force his inarticulate swirls into a grammar, into a kind of differentiation or speaking. I find myself, in the midst of Pollock’s beiges, grays, and blacks, craving vivid reds and greens. In a moment of weakness toward the end of my third session with Poussin, I sneak a look at the descriptive placard on the museum wall, with the dispiriting result that the painting remains silent as ever. In both paintings, I fall in love with little details and passages, which I visit again and again. Above all, I struggle to negotiate with these paintings, to coax them into conversation,

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1 I take the narratives of Shaler and Scudder from Barnes, Christensen, and Hansen, Teaching and the Case Method (Harvard Business School Press, 1975), pp. 125-128.
to calm my own restlessness, to come to terms with the limitations of my critical vocabularies and efforts. I struggle, in other words, toward some truthful apprehension of the thing itself.

III

Not long ago, in the Lilly Fellows Colloquium, my colleague Jennifer Miller (who is, like me, a teacher of literature) commented that her students tend to do their best work when they quote a great deal from the text at hand. This comment struck me, because it rings so very and remarkably true. If a student writes a critical essay without lavishing quotations and details on that essay, the student will almost certainly write badly. Perhaps coherently, perhaps even eloquently, but—from the standpoint of literary criticism—badly. This principle has much to do with the question of why a literary text is worth reading at all, and the answer to that question is nothing that any summary of any text can help us to discover.

IV

On which topic, a sonnet, by Gerard Manley Hopkins:

As kingfishers catch fire, dragonflies draw flame;
    As tumbled over rim in roundy wells
    Stones ring; like each tucked string tells, each hung bell’s
Bow swung finds tongue to fling out broad its name;

Each mortal thing does one thing and the same:
    Deals out that being indoors each one dwells;
    Selves—goes itself; myself it speaks and spells,
Crying What I do is me: for that I came.

Í say more: the just man justices;
    Keeps gráce: thát keeps all his goings graces;
Acts in God’s eye what in God’s eye he is—
    Christ. For Christ plays in ten thousand places,
Lovely in limbs, and lovely in eyes not his
    To the Father through the features of men’s faces. (1877)

V

This principle has also to do, though perhaps not obviously, with the topic of conversation. I have sometimes been surprised at how central the art of conversation is to my work in the classroom. I frequently encourage my students to think of our courses together as an
exercise in conversation, as a chance to grow in the discipline of hospitality. Such an approach arises from my hope that collegiality can be, for us, more than just a pleasure or a cultural refinement. To be collegial is to look upon the face of the other and see a person there. Real conversation is an ethical act, for in it I acknowledge that the person in front of me is worthy of my attention, that she has a mind as I have. I become patient with her, submit to her pace, enter into her questions and perceptions. I allow myself to be touched by her suffering, enlightened by her wisdom. I learn to attend to her voice, and not merely to my own summary, revision, or approximation of her voice—which is to say that I learn, in the practice of humane conversation, something like the practice of attending to the thing itself.

VI

Not ideas about the thing but the thing itself. This is the burden of my work in teaching poetry. Every work of poetry is, after all, singular. When Shakespeare writes about nature (in King Lear) or seeming (in Hamlet), he hasn’t set out to write about themes which we could have summarized and considered without the help of his plays. In a certain sense, he hasn’t set out to write about anything. By digging at “nature” and “seems” in the way he does, Shakespeare means to penetrate all the way to the bedrock of those words and of the beliefs, narratives, conventions, and metaphors those words imply. Those words, in his hands, become wild and whirling, self-contradictory, impossible to control. At certain moments they break down altogether, and Shakespeare’s poetry therefore invites us into an apprehension of what Lear calls “the mystery of things,” the plenitude that language pretends, but always fails, to domesticate and contain. Language, like all human institutions, is always dying, and is always being attenuated, emptied out, in the interests of political and material gain (U. S. Cellular’s latest marketing campaign is called, “The Belief Project”). Not easily and not by any natural process, can language be fitted out to express the deepest currents of reality: God, love, depravity, resurrection, death, creation, marriage, hatred, fear. We need poetry.

And we need criticism because we need the discipline of attending to the thing itself. I wish I knew better how to invite (or harry) my students deeper into the text at hand, into hours of hard, silent, submissive, resistant, responsive contemplation. I sometimes feel tempted to bring our text into the classroom and simply read it, with little comment beyond the occasional, “Oh, look at your fish.” Does not Hamlet say Hamlet better than we ourselves could? Is not the first task simply to attend? But this is difficult. Real attention seems, after all, to involve necessarily a kind of transformation or translation, as I learned in my hard exchanges with Jackson Pollock and Nicholas Poussin. It isn’t enough to look at the thing. I have to gain some purchase on it, write and rewrite it for myself, find a place to plant my feet. The same must have been just as true for Shakespeare as it is for us. I imagine him puzzling over Hamlet for years after, trying to make sense of what the play has discovered. No doubt he wrote Othello, or The Tempest, just for that reason. In a sense, those plays are our first pieces of Hamlet criticism. Their author would perhaps have been glad for the further help of many critics to come. But he also seems to have understood that an answer to the riddles of Hamlet is not satisfactorily possible beyond the language of the play itself. The thing is indelible, is simply itself, and we will never quite know how to close the distance between ourselves and everything the play says and sees—that everything is, like all things, too big for grasping. Its first and final word is the word of Hopkins’s kingfisher and all his mortal things: “myself it speaks and spells, / crying What I do is me: for that I came.”
In 1787, a female African slave named “Belinda” presented an impassioned plea for justice before the Legislature of Massachusetts in Boston. Relying on her faith in West African spiritualism, Belinda called upon the sacred forces of nature to aid in winning the case against her master. Citing her advanced age and her indigent daughter, Belinda argued the master owed financial compensation for her labor. News of this slave woman’s successful petition soon spread to Philadelphia where it was reprinted by a city journal. Although this African woman did not embrace faith in the Christian God, her written petition, albeit penned by an unknown third person, may represent a precursor to the spiritual writing and preaching of black holy women in the early nineteenth-century. Belinda’s request for a hearing symbolized a black woman’s entrance into the public sphere. The narrative account of her life and its struggles painted a persuasive picture of spiritual power and resistance. In effect, Belinda boldly identified the sins of her master and proposed a way to right the wrongs. Her efforts to convert the legislature bore fruit—the sacred forces had touched the hearts of unbelievers.

Belinda’s decision to plead her case before the Massachusetts assembly found its roots in a number of contemporary events: the Revolutionary War and its rhetoric of freedom and liberty; the impact of the manumission movement; the expansion of antislavery societies; and the evangelical sentiment unleashed by the Second Great Awakening (1790-1845). Evangelicals merged antislavery religious traditions with the new revolutionary ideology and used it to promote the abolitionist movement. The belief that all people were equal in the sight of God struck a deep cord with blacks, both slave and free. Between the end of the American Revolution and the early nineteenth-century, thousands of Methodist and Baptist churches admitted blacks to their congregations. By 1800, black Methodists often outnumbered white parishioners in the churches in Maryland and South Carolina. From this climate emerged a community of black women who claimed to have been divinely inspired to preach the Gospel. Barred from delivering God’s Word in churches, these itinerant preachers held meetings in barns, schools, homes, or outside in fields. Most of them belonged to the low to low-middle classes, and few had received any formal education.

Although these women insisted they had tried to deny their call to preach, each testified how God had overcome her fears by promising to guide and protect her in her journey. Viewing themselves as “clay in the hands of the potter,” these black holy women claimed, like the prophet Jeremiah, they did not speak their own words, but God’s. Despite their divine calling, black and white female preachers were accused of violating the Pauline injunction “Let your women keep silence in the churches: for it is not permitted unto them to speak . . . ” (1 Corinthians 14: 34-35, KJV). During the nineteenth-century, many ministers argued that Christian women who invited men to stare at them in public, even to proclaim the Gospel, were no better than prostitutes. Teaching Sunday School, serving as foreign missionaries, or even exhorting others to repent was allowed by most churches. However, violating the rules of modesty by standing in the masculine space of the pulpit was not.

Curiously, the largest, most influential churches in the early nineteenth century, particularly the Congregationalists, the Presbyterians, and the Episcopalians, forbade women to
preach. On the other hand, a small number of new, dissenting denominations challenged the restrictions on women’s religious speech. When state legislatures stripped colonial churches of the power to collect taxes for their support, upstart religious groups, inspired by the populist rhetoric of the American Revolution, deliberately set themselves apart from the “worldliness” of the established churches by insisting God could choose anyone—even the poor, uneducated, enslaved, or female—to preach the Gospel. Evangelicals who allowed women into the pulpit—the Freewill Baptists, the Christian Connection, the northern Methodists, the African Methodists, and the Millerites—found their motivation in both practical and theological terms. Due to their spectacular growth in the early nineteenth century, all of these new groups lacked enough male ministers and relied on women as well as men to lead meetings and to organize new churches. Especially during emotional outpourings at camp meetings, women preachers helped control the tumultuous atmosphere by mixing soothing words with fiery warnings to repent.\textsuperscript{5}

For deeper theological reasons, these denominations supported female preaching. Believing religious authority came from heartfelt religious experience, not education, these groups warned that established churches had “quenched the Holy Spirit” by mandating ministers to be college-educated. Ordinary people, they argued, could read and interpret the Bible and become as much of a biblical scholar as a minister educated at Harvard. Convinced that God could communicate directly with people through dreams, visions, and voices, they insisted education, wealth, social position, and gender were all meaningless to God. Indeed, the Lord could use any vessel for His divine purpose.\textsuperscript{6}

Fearful the apocalypse might be imminent, many members of these fledgling religious groups also sanctioned women preaching as a sign of the approaching millennium. For example, the Millerites—named after William Miller (1782-1849), a farmer famous for his millennial predictions—believed the world would end in 1844. Because they believed they were living at the end of human history, Millerites disdained faith in human progress and urged every convert, male or female, to spread the gospel before it was too late. Basing their belief on Joel’s promise that at the end of the world “your sons and your daughters shall prophesy” (Joel 2:28), Millerites endowed female preaching with transcendent significance. Whenever a woman preached from the pulpit, she became a visible reminder that Christ might soon return to earth.\textsuperscript{7}

The Christian Connection, another group of evangelicals who welcomed female preachers, cited many other biblical texts where women, far from keeping silent, spread the good news of Christ’s resurrection as witnesses and evangelists. They argued Paul’s warning to “keep silence in the churches” had been directed only at the disorderly women of Corinth, not at all Christian women. If he had meant to forbid women from preaching, Paul would not have also told women to cover their heads when “praying or prophesying” in public (1 Corinthians 11:5).\textsuperscript{8} The Freewill Baptists insisted that women, like men, had been created in the image of God. Female preachers in these churches often portrayed God as angry, vengeful, and all-powerful. Such hellfire and brimstone sermons often evoked fear and trembling from the congregations.\textsuperscript{9}

By the very act of speaking in public, female preachers appeared dangerously radical—perhaps seeking to subvert male authority. In truth, the majority of these women did not believe the Bible sanctioned women’s political, legal, or economic equality to men. According to historian Catherine A. Brekus, these female holy women were “biblical” rather than secular feminists. When they began their careers, many were single and those who decided to marry usually left the pulpit unless their husbands supported them. On occasion, women preachers married clergymen who encouraged them to serve as “helpmates” in their ministry. Because they
were not paid even the meager wages of men, female preachers resorted to sewing, 
housecleaning, or washing clothes to make ends meet. In addition, they endured constant 
criticism, harassment, and sometimes threats of bodily harm.¹⁰

Without a doubt, black female preachers faced greater hostility than did their white 
counterparts during the early nineteenth century. While both groups of women challenged sexual 
stereotypes and religious norms, black holy women met with bitter racial opposition as well as 
thelogical resistance. Theirs was a two-pronged journey of persistence and endurance. Having 
accepted the divine call to preach, these black women shared the Gospel of spiritual freedom and 
eternal peace with those who would listen. Deeply imbued with religious convictions, they 
visualized their work as a way of inviting others to an enduring faith and trust in God. Speaking 
to both free and enslaved audiences, black women preachers reminded their “saved” brothers and 
sisters that their bondage in slavery on this earth did not negate their everlasting freedom in 
Christ. Though slaves often lived lives of tortured silence, they could find solace in the gospel of 
“inner emancipation.” These women preached a message that outlined proposed roads to 
freedom and peace. The manumission movement, antislavery societies, and the Second Great 
Awakening all promoted the end of slavery. These efforts represented on-going earthly attempts 
to destroy the peculiar institution. In the meantime, black holy women offered their audiences the 
hope of an “inner wholeness” to ease the pain of spiritual and earthly enslavement.¹¹

This paper seeks to evaluate how and why Elizabeth, an early nineteenth-century black 
holiness preacher, preached the gospel of “inner emancipation” and “inner wholeness” to both free 
and enslaved audiences. Although a number of articles and books have dealt with nineteenth-
century black women preachers in the context of sexual and racial stereotypes, few have 
concentrated solely on the deep spiritual convictions which led women like Elizabeth to endure 
countless hardships while answering the divine call to preach. I intend to show that hearing and 
answering God’s call on her life proved more important and enduring for Elizabeth than 
acceptance by society as a whole. This study will examine the rich spiritual journey of this 
remarkable black female preacher in the context of how she viewed faith’s role in attaining true 
freedom.

Throughout the nineteenth century, religion, especially Christianity, served as an essential 
and immoveable force in the lives of blacks, free or slave. Early African slaves, like Belinda, 
called on the sacred spirits to shelter them against the injustices of human bondage. The 
religious experience for blacks served as a group heritage. When a religious sentiment permeated 
black thought, it generated a reason for action. An eternal kinship with the divine “enabled them 
to keep on keeping on.” Though unable to control their own lives, blacks in the early nineteenth-
century could find comfort and assurance in the Christian God. The moving songs and rich 
imagery of Christianity provided countless slaves communion with imperishable stability. This 
sense of security gave men and women the courage to dream.¹²

During the mid-eighteenth century, large numbers of slaves and free blacks responded to 
the emotionally charged call of Methodist preachers at camp meetings and revivals during the 
First Great Awakening (1730s-1740s). In contrast to the cold intellectualism of the Puritan 
churches, Methodism’s emphasis on a heart-felt religious experience and its opposition to 
slavery convinced many blacks to join their ranks. At the so-called Christmas Conference in 
1784, the various Methodist societies scattered throughout the newly independent colonies 
formally organized into the Methodist Episcopal Church. Even though Methodism retreated from 
its original opposition to slavery in 1785, the number of black members continued to increase.
More than likely, the onset of the Second Great Awakening in the late 1780s explained blacks’ abiding support for the denomination. After all, during this period of evangelism, black men and women were encouraged to exhort and preach the Gospel. However, by 1787 two black preachers, Richard Allen and Absalom Jones, withdrew from the predominantly white St. George’s Methodist Episcopal Church in Philadelphia after being forced to leave the “white” praying section of the church. This separation and the subsequent organization of the Free African Society eventually led to establishment of the Bethel Church of Philadelphia. This church became the mother church of a new denomination, the African Methodist Episcopal Church.\(^{13}\)

In this religious environment, the earliest black female preacher, known simply as Elizabeth, was born a slave in Maryland in 1766. Although she never possessed more than her Christian name, her true identity rested in her faith in God. Her father and mother, both religious people, belonged to the Methodist Society. Elizabeth’s early Bible training came from her father who read Scripture to his children every Sabbath morning. By doing so, he instilled in them a fervent belief in God’s Word and the power of prayer. Sadly, despite the spiritual benefits of her father’s teaching, Elizabeth never learned to read very well.\(^{14}\)

At the tender age of five, Elizabeth often felt the overshadowing of the Lord’s Spirit without understanding the meaning of such an occurrence. These influences continued for six years, she remarked, “particularly when I was alone, by which I was preserved from doing anything that I thought was wrong.”\(^ {15}\) By age eleven, her master sold her to a new owner some miles from her family. Distraught and lonely, Elizabeth disobeyed the overseer and walked twenty miles to find her mother. Having stayed for several days, Elizabeth realized she must return to her new home. At their parting, Elizabeth’s mother shared these words with her daughter: “nobody in the wide world to look to but God.” These words fell upon her heart “with ponderous weight” and seemed only to add to her grief. In essence, Elizabeth’s mother had given her up to the care of the Lord and encouraged her daughter to rely only on God.\(^{16}\)

Acting upon her mother’s parting words, Elizabeth immersed herself in prayer. Finding an altar in every lonely place, she “mourned sore like a dove and chattered forth” her sorrow in the corners of the field and under the fences. Continuing in this state for six months, Elizabeth wept profusely, lost her appetite, and grew too weak to work. Expecting to die at any moment, she feared meeting her maker without being prepared to do so. “Must I die in this state,” she cried, “and be banished from Thy presence forever?” Realizing she was a sinner in God’s sight, Elizabeth asked the Lord to pardon her. At this point in her vision, her “spiritual eye” saw an awful, fiery pit of human misery. Fearing she would soon plunge into the pit, a voice instructed her to “rise up and pray.” Her spirit was then taught to pray, “Lord have mercy on me—Christ save me.” With every fervent prayer, Elizabeth found herself raised higher and higher above the fiery gulf. Looking straight ahead, she saw the Savior standing with his hand stretched out to receive her. Sensing her time of deliverance was near, she sprang forward and fell at his feet, crying, “Thou hast redeemed me.” Next, Elizabeth was led upward till she came to the celestial world and to heaven’s open door. As she viewed the millions of glorified spirits in white robes, a voice asked, “Art thou willing to be saved in my way?” At first she stood speechless until a voice softly whispered, “If thou art not saved in the Lord’s way, thou canst not be saved at all.” With this divine clarification Elizabeth exclaimed, “Yes, Lord in thy own way.” Immediately a light fell upon her head, and she was filled with light. As she was shown the world lying in wickedness, Elizabeth realized her calling to preach repentance to the people before the day of
the Lord was complete. Though some would laugh at her and others would scoff at her, Elizabeth rested in God’s eternal presence in her life throughout this journey.  

Elizabeth’s vivid description of her dramatic conversion and divinely-inspired calling occurred just before her thirteenth birthday. Though, during the next year, she lived in a place with no preaching and no religious instruction, Elizabeth joyfully spent time among the haystacks where she felt the presence of the Lord overshadow her. With the weight upon her heart for the salvation for her fellow man, she experienced new visions where she was carried to distant lands and shown places she should have to travel and deliver God’s message. Years later, she visited those very towns and countries—places of which she had never heard.  

When she reached her thirtieth year, Elizabeth’s new Presbyterian owner eventually granted her freedom. Although she attended religious meetings regularly, Elizabeth rarely spoke up during the services. Not until age forty-two did she recognize the time for her to deliver the Lord’s message had come. Dwelling on her poor reading skills, Elizabeth questioned her ability to understand and impart the Scriptures to others. Greatly discouraged by her own weaknesses and ill-conceived advice of religious leaders of the day, she finally returned to the Lord for guidance. God revealed to Elizabeth His will for her life: “I should be resigned to die any death that might be my lot, in carrying his message, and be entirely crucified to the world, and sacrifice all to His glory that was then in my possession, which His witnesses, the holy Apostles, had done before me.” Because the Lord had given her evidence of a clean heart, Elizabeth now walked and talked with God and “knew nothing but Jesus Christ, and him crucified.”  

One day following this encounter, Elizabeth felt led by the Spirit to go to a poor widow and asked if she might hold a prayer meeting at the widow’s house. With great joy, Elizabeth joined the small gathering of a few colored sisters. As she knelt to offer a closing prayer, the house seemed filled with light. Just then, Elizabeth became aware of the presence of a strange man in the room. He proved to be a watchman sent to break up the meeting. All but two of the sisters grew so terrified that they left the house, fearful they might receive some personal injury. At first, a feeling of weakness came over Elizabeth, but soon she grew courageous in the Spirit. The watchman explained to Elizabeth a complaint had been filed concerning the racket being made at their meeting disturbed the neighbors’ sleep.  

Elizabeth replied:

> a good racket is better than a bad racket. How do they rest when the ungodly are dancing and fiddling till midnight? Why are they not molested by the watchmen? And why should we be for praising God, our Maker? Are we worthy of greater punishment for praying to Him? And are we to be prohibited from doing so, that sinners may remain slumbering in their sins?  

While speaking these words Elizabeth grew warm with heavenly zeal, laid her hand upon the man and shared with him the gospel truth: “How do sinners sleep in hell, after slumbering in their sins here, and crying, ‘let me rest, let me rest,’ while sporting on the very brink of hell? Is the cause of God to be destroyed for this purpose?” In response to these powerful words, the watchman turned pale, trembled, and begged this holy woman to pardon him. He vowed never to disturb a religious assembly again and wished Elizabeth and the sisters success. Although the remaining women in the house expressed a sense of delight at the outcome, Elizabeth chided those who fled for their cowardice and the missed opportunity to lead the watchmen to a saving knowledge of the Lord.
Despite the watchman’s solemn vow, the elders of Elizabeth’s Methodist congregation joining with “the wicked people” of the community, stopped any more such meetings and quieted “that woman.” However, Elizabeth continued to go forth “with a zeal not her own.” For several years, her ministry witnessed the conversion of many souls. Throughout this time, she experienced bouts of spiritual jubilation, as well as spiritual weakness. During one of her darkest moments of persecution, Elizabeth compared herself to the speckled bird mentioned in Jeremiah 12:9: “Mine heritage is unto me as a speckled bird, the birds round about are against her; come ye, assemble all the beasts of the field, come to devour.” Treated like an outcast by influential members of her own denomination, Elizabeth was hunted down in every place she appointed a meeting. Despised on account of her gracious calling, she became disillusioned with the very ministers to whom she looked for instruction. Feeling a spiritual backwardness and inability to pray, a divine pressure came upon Elizabeth to arise and express herself openly. As she delivered her exhortation, the Spirit came upon her with life, and a victory was gained over the power of darkness:23

Thus we see when the heart is not inspired, and the inward eye enlightened by the Spirit, we are incapable of discerning the mystery of God in these things. Individuals creep into the church that are unregenerate, and after they have been there awhile, they fancy that they have got the grace of God, while they are destitute of it. They may have a degree of light in their heads, but evil in their hearts; which makes them think they are qualified to be judges of the ministry, and their conceit makes them very busy in matters of religion, judging of the revelations that are given to others, while they have received none themselves. Being thus mistaken, they are calculated to make a great deal of confusion in the church, and clog the true ministry.24

Elizabeth’s discernment of the dangers of an unregenerate person in the church represented a new level of spiritual awareness in her journey. The closer her walk with the Lord, the more He revealed His purpose for her life. Refreshed and empowered each day from being in God’s presence, she grew more open to answering His calls for service. At one of her religious gatherings, a large number of white inhabitants of the area were joined by many colored people. According to Elizabeth, no doubt both groups wanted to hear what this “old coloured woman had to say.” While she delivered God’s message, a well-known writer in the audience began to take down the discourse in short-hand. Believing the Almighty anointed her with such a portion of his Spirit, the Lord cast away the writer’s pen and paper, causing him to hear the message with patience. As a result, the man “was much affected, for the Lord wrought powerfully on his heart.” After the meeting, he offered Elizabeth his hand with a solemn countenance and gave her money to cover her travel expenses.25

Although repeatedly condemned by leaders of her church, Elizabeth found great strength in God’s power to continue His work through her. At the Lord’s direction, she travelled even more extensively in the ministry. While in Maryland, Elizabeth felt led to speak from the passage, “Woe to the rebellious city.” Apparently, this message met with much opposition. Following the meeting, the people took Elizabeth before the squire. However, the Lord delivered her from their hands. Holding meetings in Virginia proved challenging as well. The people there refused to believe that a colored woman could preach. Seeking to imprison her for speaking against slavery, Elizabeth was asked by what authority she spoke and if she had been ordained. Her answer left no room for further discussion, “not by commission of men’s hands; if the Lord had ordained me, I needed nothing better.” 26
As she continued her travels, Elizabeth conversed at different times with white ministers of the gospel. Many of them, she noted, confessed not to believe in revelation. In her view, these men were sent forth as ministers without Christ’s authority. During a conversation, one of these ministers asserted, “You think you have these things by revelation, but there has been no such thing as revelation since Christ’s ascension.”

Elizabeth then asked, “[W]here did the apostle John get his revelation while on the Isle of Patmos?” Upon hearing this, the white minister rose up and left. Perhaps sensing this man’s sinister intentions, Elizabeth exclaimed in her spirit, “[G]et thee behind me Satan.”

Throughout her itinerant ministry Elizabeth visited many remote places, some with meeting houses and some without. Regardless of the venue, the Lord poured out His Spirit upon these gatherings. While in Canada, Elizabeth abided in several settlements of colored people and felt much at home. As she journeyed through the different states of the Union, she especially appreciated the kindness and sympathy of the Quaker Friends and their families. She found their encouragement and support most uplifting. In Michigan, Elizabeth discovered a wide field of labor among her own color. Having lived there four years, she established a school for colored orphans. Realizing the importance of “religious and moral agriculture of children,” Elizabeth expressed thankfulness at the availability of white teachers.

By age eighty-seven, health problems released Elizabeth from travelling further in her “good Master’s cause.” Choosing to retire in Philadelphia, she remained there until her death fourteen years later at age one hundred and one. During her ninety-seventh year, a third party penned and recorded her life’s journey. In 1863, Memoir of Old Elizabeth, a Coloured Woman was published. By 1889, the Quakers republished and retitled her life story as Elizabeth, A Colored Minister of the Gospel, Born in Slavery.

The latter work included a moving description of the aged Elizabeth’s daily struggle with painful gangrenous sores extending from the toes on one foot up to the knee. The disease destroyed the flesh, leaving the bone bare and black. Despite her intense agony, Elizabeth’s attendant noted, “many sweet sayings of heavenly wisdom fell from her lips. . . . [and] words of loving exhortation and true Christian sympathy.” A few days prior to her death, being asked how she was, Elizabeth answered, “this finely wrought frame is decaying away. I am moving along the shore, looking across the sea of sorrow at the heavenly habitations. Sometimes I can see nothing but the peace and glory of heaven. What is all that I suffer, if I am only counted worthy to enter?” Two hours before she died, Elizabeth’s mind became quite clear and she said, “my body is full of pain all over. I long for Jerusalem my home. I long to see my Saviour’s face. My shackles are broken. Suffering has washed my robes and made them white in the blood of the Lamb; now let me be quiet for two hours.” At the end of that time, her breathing gently ceased and her spirit entered through the pearly gates into Heaven where none can say, “I am sick.”

Elizabeth, a black holy woman of the Gospel, left this world on June 11, 1866.

Who then carried on Elizabeth’s example? What impact did Old Elizabeth have on other black female evangelists in the nineteenth century? Why did she consider her call to preach more important than being accepted by society, both as a woman and a black woman? Why did she view her relationship with God as experiencing inner wholeness? At what time in her life did she see herself as being sanctified? Why did she believe a person’s authentic faith in God led to inner emancipation—the perfect freedom?
Despite her lack of education, Elizabeth’s life journey inspired such early nineteenth-century black holy women as Jarena Lee, Zipha Elaw, and Rebecca Cox Jackson to serve as a “mouth-piece for the Lord.” Each of these black female preachers claimed membership in the African Methodist Episcopal denomination, and all suffered oppression by men and women, both black and white, as they acted as an instrument of God. In addition, these black women evangelists served the Lord as itinerant preachers, constantly traveling to spread the Gospel. All along the way, divine protection sheltered and guided their every step. In the view of historian Chanta M. Haywood, each of these women clung to God as the directing and legitimizing force behind her voice. Like Elizabeth, Lee, Elaw, and Jackson considered their call to preach more important than being accepted by society. These black holy women overwhelmingly desired to conform to God’s will by bringing His Word to the public. For them, this sacred mission must be accomplished at any cost. Religious conviction compelled these women to speak and write truth, even if it meant opposing leaders within their own race and congregation. According to Haywood, these black female evangelists chose to rebuke limitations on their preaching by invoking their positions as God’s “prophesying daughters.”

Elizabeth’s reference to inner wholeness might be traced to the American Holiness Methodists. As early as 1819, groups of Methodists in New York organized prayer meetings emphasizing extraordinary spiritual and visionary experiences as divine outgrowths of conversion and sanctification. Those who experienced these special blessings, historian Jean M. Humez contended, entered into a “state of Christian perfection, purity, holiness, or perfect love, in which one felt permanently beyond the reach of committing further intentional sin.” Although Elizabeth did not refer to the holiness doctrine in her memoir, she may have been influenced by this controversial religious concept. For example, the vivid description of her conversion and divinely-inspired calling may be considered both an extraordinary and visionary experience. Her expressions “I saw with my spiritual eye” and “unsure if I was in the body or out of the body” might be linked to a state of purity in the holiness doctrine. Whether or not Elizabeth incorporated this concept in her spiritual journey is unclear. However, her memoir clearly fixed Elizabeth’s righteousness at the center of her authorization by God to act for Him. She sincerely viewed herself as an embodiment of His Word and continually sojourned to what historian Jaycelyn K. Moody described as the “state” of divine grace. Through countless ecclesiastical journeys, Elizabeth longed to dwell daily in the very presence of the Lord. Entrance into this divine state came only when she “knew nothing but Jesus Christ, and him crucified.” While in His presence she experienced inner wholeness and completeness in her spirit.

Like other nineteenth-century black holy women, Elizabeth considered herself unworthy of God’s grace and mercy. Following her dramatic conversion and visionary experience of heaven and hell, Elizabeth knew the Lord had saved her from her sins and redeemed her life for eternity. As she sought a closer walk with her Savior, she accepted that God had sanctified her—set her apart to do His will. During Elizabeth’s encounter at the prayer meeting in the widow’s house, she realized how the Lord used her to share the Gospel with the watchman. Now viewing her journey as a sacred mission, Elizabeth joyfully submitted to God’s lordship in her life. For her, sanctification represented a process by which a person is made holy, resulting in a changed life, a consecrated, God-honoring life. Even though this process remained mysterious from a human standpoint, Elizabeth’s deepening faith in the Lord erased all doubt.
Elizabeth’s growing trust and reliance in God led her to a sense of inner emancipation and eternal freedom. Even when her Presbyterian owner freed her, Elizabeth still experienced bondage by not deeming herself worthy to speak during worship services. She questioned her ability to understand and impart God’s Word to others. Despite her dramatic conversion experience and divine call to preach, Elizabeth relied more on herself than on the Lord. However, once she accepted that God had sanctified and equipped her for His service, Elizabeth experienced spiritual liberation. Once she had been a servant to man. Now, she found perfect peace and freedom in serving God. Submitting her life to the one true Master, Elizabeth’s faith led her to eternal freedom in Christ.

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1 See “Petition of an African Slave to the Legislature of Massachusetts,” in The American Museum, or Repository
5 Ibid, 22.
6 Ibid, 23.
7 Ibid.
8 Ibid. See Rebecca Miller, “Duty of Females,” Christian Palladium 10, no. 2 (May 15, 1841), 21-22, and Rebecca Miller, “Female Improvement,” Christian Palladium 10, nom 3 (June 1, 1841), 35-36. The Christian Connection/Christian Connexion or Christian Church was a loose fellowship of churches whose adherents’ anti-organizational commitments prevented one from referring to “union,” per se, at least before the middle of the nineteenth-century. By the 1830s and 1840s, the leadership of the Christian Connection, the Freewill Baptists, the Methodists, and the African Methodists grew larger and more powerful and withdrew much of their support for female preachers.
C. Eric Lincoln and Lawrence H. Mamiya, *The Black Church in the African American Experience* (Durham: Duke University Press, 1990), 49-52. The Free African Society, established by Richard Allen and Absalom Jones, served as both a religious and secular source of aid for blacks. The Society served as a precursor to the founding of Philadelphia’s Mother Bethel African Methodist Episcopal Church. Interestingly, during the First Great Awakening John Wesley baptized his first two black converts, one of whom was a woman, on November 29, 1758.


Elizabeth is often referred to as “old” because she lived until the ripe *old* age of one hundred and one. According to one source, Elizabeth was 97 years old when her life narrative was first penned on her behalf.


Ibid, 8-10.

Ibid, 10-11.

Ibid, 11.

Ibid, 12.

Ibid, 12-14.

Ibid, 15.

Ibid, 15-16.

Ibid, 16-17.


Ibid, 18-19.


Conversion (accepting the gift of salvation made possible by the death, burial, and resurrection of Jesus Christ) and sanctification (being set apart; the process of being made holy, resulting in a change of life-style for the believer; being consecrated) were the two primary experiences of spiritual rebirth officially sanctioned by Holiness Methodism. Early American Holiness Methodists viewed the state of “holiness” as the second blessing of sanctification. Throughout the 1830s and 1840s, the Holiness doctrine produced controversy and sometimes schism within Methodism while attracting the attention of non-Methodist evangelicals as well. Although John Wesley was the originator of the Holiness doctrine, he did not himself profess holiness and thought of it as a rare experience.

32 Jean M. Humez, “‘My Spirit Eye’: Some Functions of Spiritual and Visionary Experience in the Lives of Five Black Women Preachers, 1810-1880” in Barbara J. Harris and JoAnn K. McNamara. Eds., Women and the Structure of Society: Selected Research from the Fifth Berkshire Conference on the History of Women. (Durham: Duke University Press, 1984), 133. Also see Timothy L. Smith, “Righteousness and Hope: Christian Holiness and the Millennial Vision in America, 1800-1900,” American Quarterly, Vol. 31, No. 1 (Spring 1979), 25. Conversion (accepting the gift of salvation made possible by the death, burial, and resurrection of Jesus Christ) and sanctification (being set apart; the process of being made holy, resulting in a change of life-style for the believer; being consecrated) were the two primary experiences of spiritual rebirth officially sanctioned by Holiness Methodism. Early American Holiness Methodists viewed the state of “holiness” as the second blessing of sanctification. Throughout the 1830s and 1840s, the Holiness doctrine produced controversy and sometimes schism within Methodism while attracting the attention of non-Methodist evangelicals as well. Although John Wesley was the originator of the Holiness doctrine, he did not himself profess holiness and thought of it as a rare experience.


34 Memoir of Old Elizabeth, 8-10.
C. S. Lewis and the Lion Mathematics
By Matt D. Lunsford

Clive Staples Lewis (1898-1963) was one of the intellectual giants of the 20th century and arguably the most influential Christian author of that period. Lewis was born in Belfast, educated at Oxford, and taught medieval and Renaissance literature at both Oxford and Cambridge. As a scholar, he made significant contributions to the areas of literary criticism, children’s literature, and fantasy literature. His conversion to Christianity is well documented in his autobiography _Surprised by Joy_, and gave rise to a body of apologetics works. In spite of his own personal lack of success in the area of mathematics, C. S. Lewis exhibited a lofty appreciation of the discipline as demonstrated by his numerous references to mathematics and to mathematical objects and by his recurrent use of mathematical terminology in his apologetic writings. This paper will explore how Lewis used mathematics, the discipline itself and its specific content, extensively in his apologetic works.

Lewis’ mathematical career was less than spectacular. He enjoyed all mathematics that involved mere reasoning but was less fond of mathematical calculation. He admits that he “could never have gone very far in any science because on the path of every science the lion mathematics lies in wait for you.” (Lewis, _Surprised by Joy_ 137) In his early training at Oldie’s School, Lewis credits only some geometry and grammar as accomplishments. His tutelage later under Kirk (Mr. Kirkpatrick) proved indispensable for Lewis’s ratiocination skills. It was with Kirk that he prepared for his first attempt at _Responsions_, a required examination at Oxford that included elementary mathematics. Lewis was not successful on his first attempt and continued to prepare for the exam with Mr. Campbell. His preparation included algebra, a subject for which Lewis had a personal dislike—“devil take it!” (Lewis, _Surprised by Joy_ 187). He never passed _Responsions_; however, due to his service in World War I, he was granted a waiver. Lewis claims that, without this exemption, his career at Oxford would have concluded prematurely.

Lewis’s use of mathematics in his apologetic writings will be considered in two broad categories: 1) the relationship between mathematics and particular laws and 2) the use of geometry, especially the concept of dimension. The first category refers to the use of mathematics, either because of a widely held belief about the discipline or because of the attributes of a specific mathematical example, to elucidate the characteristics of three laws—laws of thought, laws of morality, and the laws of nature. The second category refers to the utilization of geometry and spatial dimensions either to resemble or to exemplify a point of difficulty for the reader.

In _Miracles_, Lewis states that rational thought and the conscience of man are not products of the system of Nature. He refused to accept a “behavioristic theory of logic, ethics, and aesthetics” (Lewis, _Surprised by Joy_ 208). This led him to consider the connection between mathematics and the laws of thought, the laws of morality (Natural Law), and the laws of nature.

In perhaps his greatest compliment to the discipline, Lewis states, “Pure mathematics is the type of successful thought” (Lewis, _God in the Dock_ 65). To him, the laws of thought were self-evident and unchangeable, for to modify the laws of thought would, in essence, nullify the ability to reason and thus leave one in the situation of not being able to know anything about
reality: “in other words, unless Reason is an absolute—all is in ruins” (Lewis, The Weight of Glory 103). The laws of arithmetic were seen to be in the same position. Since the simple rules of arithmetic follow deductively from self-evident axioms, just as rational thinking follows from the laws of thought, these rules are immutable. A multiplication table is self-evident once the simple operations of arithmetic are learned. As Lewis remarks, “We all learned the multiplication table at school. A child who grew up alone on a desert island would not know it. But surely it does not follow that the multiplication table is simply a human convention, something human beings have made up for themselves and might have made different if they had liked?” (Lewis, Mere Christianity 24)

Suppose one wants to put this Reason to work to discover truths about the universe. How can one be sure that a belief is actual truth and not just wishful thinking? To address this question, Lewis uses an analogy from arithmetic:

Suppose, I think, after doing my accounts, that I have a large balance at the bank. And suppose you want to find out whether this belief of mine is “wishful thinking.” You can never come to any conclusion by examining my psychological condition. Your only chance of finding out is to sit down and work through the sum yourself. When you have checked my figures, then, and then only, will you know whether I have that balance or not. If you find my arithmetic correct, then no amount of vaporing about my psychological condition can be anything but a waste of time. If you find my arithmetic wrong, then it may be relevant to explain psychologically how I came to be so bad at my arithmetic, and the doctrine of the concealed wish will become relevant—but only after you have yourself done the sum and discovered me to be wrong on purely arithmetical grounds. It is the same with all thinking and all systems of thought. If you try to find out which are tainted by speculating about the wishes of the thinkers, you are merely making a fool of yourself. You must first find out purely on logical grounds which of them do, in fact, break down as arguments. Afterwards, if you like, go on and discover the psychological causes of the error. (Lewis, God in the Dock 272-3)

So, according to Lewis, the logical procedure needed to correct a mistake in arithmetic displays a prototype of successful rational argumentation. Lewis was so bothered by the modern method of debate which assumes that one is wrong and then argues why he is wrong rather than demonstrating that he is wrong, that he gave it a name—“Bulverism” (Lewis, God in the Dock 273).

What does Reason have to say about the truth claims of Christianity? Lewis draws upon his arithmetical analogy: “But, of course, being a Christian does mean thinking that where Christianity differs from other religions, Christianity is right and they are wrong. As in arithmetic—there is only one right answer to a sum, and all other answers are wrong: but some of the wrong answers are much nearer being right than others.” (Lewis, Mere Christianity 43) In a different work, he asserts, I was taught at school, when I had done a sum, to "prove my answer." The proof or verification of my Christian answer to this cosmic sum is this. When I accept Theology I may find difficulties, at this point or that, in harmonizing it with some particular truths which are imbedded in the mythical cosmology derived from science. But I can get in, or
allow for, science as a whole. Granted that Reason is prior to matter and that the light of that primal Reason illuminates finite minds, I can understand how men should come, by observation and inference, to know a lot about the universe they live in. If, on the other hand, I swallow the scientific cosmology as a whole, then not only can I not fit in Christianity, but I cannot even fit in science.” (Lewis, The Weight of Glory 105-6)

Can one really conceive of an alternate set of moral laws? In Mere Christianity, Lewis answers, “Think of a country where people were admired for running away in battle, or where a man felt proud of double-crossing all the people who had been kindest to him. You might just as well try to imagine a country where two and two made five” (Lewis, Mere Christianity 19). He then adds, “It seems, then, we are forced to believe in a real Right and Wrong. People may be sometimes mistaken about them, just as people sometimes get their sums wrong; but they are not a matter of mere taste and opinion any more than the multiplication table” (Lewis, Mere Christianity 20). Lewis argues that the discipline of mathematics is analogous to Natural Law for two compelling reasons: 1) the basic laws of mathematics are unchanged by time and culture and “though there are differences between the moral ideas of one time or country and those of another, the differences are not really very great – not nearly so great as most people imagine – and you can recognize the same law running through them all” (Lewis, Mere Christianity 24-5) and 2) there is a standard in both mathematics and Natural Law which is independent of personal or public opinion. As Lewis writes,

The moment you say that one set of moral ideas can be better than another, you are, in fact, measuring them both by a standard, saying that one of them conforms to that standard more nearly than the other. But the standard that measures two things is something different from either. You are, in fact, comparing them both with some Real Morality, admitting that there is such a thing as a real Right, independent of what people think, and that some people's ideas get nearer to that real Right than others. (Lewis, Mere Christianity 25)

Assuming that there is a Real Morality, how can an individual use this fact to make proper moral decisions? Just as constructing a rational argument requires knowledge of the laws of thought, moral decision-making requires acknowledging the existence of self-evident truths of Natural Law. Lewis calls this collection of truths “the Tao” and claims that, “Unless you accept these without question as being to the world of action what axioms are to the world of theory, you can have no practical principles whatever. You cannot reach them as conclusions: they are premises” (Lewis, The Abolition of Man 52-3). In the essay “Why I Am Not a Pacifist,” Lewis provides a straightforward method of reasoning that involves three elements: 1) the reception of facts, 2) the recognition of self-evident truths (which Lewis calls intuition), and 3) the logical arrangement of “facts so as to yield a series of such intuitions which linked together produce a proof of the truth or falsehood of the proposition we are considering” (Lewis, The Weight of Glory 54). Lewis uses another mathematics analogy, this time from geometry, to illustrate this process. Now the geometric proof is the prototype. If a correct geometric proof is well crafted, then “each step is seen by intuition, and to fail to see it is to be not a bad geometician but an idiot” (Lewis, The Weight of Glory 54). Lewis does add that, “You can invent a simpler proof, that is, a simpler concatenation of intuitable truths. But when you come to an absolute inability to see any one of the self-evident steps out of which the proof is built, then you can do nothing” (Lewis, The Weight of Glory 55). While admitting that moral decision-making does not admit
the mathematical certainty of a geometric proof, he employs this method of reasoning to construct an argument for why he is not a pacifist.

Consider one final remark regarding Natural Law. In countering the argument that the current state of human knowledge, especially scientific knowledge, has led humans to the point that one can no longer hold to the unchanging dogmas of Christianity, Lewis notes that wherever there is real progress in knowledge, there is some knowledge that is not superseded. Indeed, the very possibility of progress demands that there should be an unchanging element...I take it we should all agree to find this sort of unchanging element in the simple rules of mathematics. I would add to these the primary principles of morality. And I would also add the fundamental doctrines of Christianity. (Lewis, God in the Dock 45)

Hence, for Lewis, the three realms of mathematics, morality, and Christianity exhibit instances of static knowledge that will never be replaced. As for progress, Lewis issues this warning:

If you are on the wrong road, progress means doing an about-turn and walking back to the right road; and in that case the man who turns back soonest is the most progressive man. We have all seen this when doing arithmetic. When I have started a sum the wrong way, the sooner I admit this and go back and start over again, the faster I shall get on.” (Lewis, Mere Christianity 36-7)

How does one understand the physical world? Lewis offers, “As regards material reality, we are now being forced to the conclusion that we know nothing about it save its mathematics. The tangible beach and pebbles of our first calculators, the imaginable atoms of Democritus, the plain man's picture of space, turn out to be the shadow: numbers are the substance of our knowledge, the sole liaison between mind and things” (Lewis, God in the Dock 46). Mathematics provides the language for expressing the laws of nature, which are the result of observed consistency and assumed uniformity in the universe. Lewis argues that by using only the method of historical probability, “we cannot say that uniformity is either probable or improbable” (Lewis, Miracles 165). Moreover, Lewis maintains that, “Three conceptions of the 'Laws' of Nature have been held. 1) That they are mere brute facts, known only by observation, with no discoverable rhyme or reason about them. We know that Nature behaves thus and thus; we do not know why she does and can see no reason why she should not do the opposite. 2) That they are applications of the law of averages. The foundations of Nature are in the random and lawless. But the number of units we are dealing with are so enormous that the behavior of these crowds (like the behavior of very large masses of men) can be calculated with practical accuracy. What we call “impossible events” are events so overwhelming improbable--by actuarial standards--that we do not need to take them into account. 3) That the fundamental laws of Physics are really what we call 'necessary truths' like the truths of mathematics--in other words, that if we clearly understand what we are saying we shall see that the opposite would be meaningless nonsense” (Lewis, Miracles 88-9).

As the laws of nature follow inductively from the observation of regularity, it remains a possibility that the laws could be violated from the outside. In fact, Lewis claims that none of the three theories prevents the Supernatural from invading Nature. The first two theories are easily addressed as the first gives no rhyme or reason why things are as we observe and thus no reason why they should continue in the same pattern, and the second, which depends on the law of averages, will work only for undoctored Nature and the question of whether or not miracles...
occur is precisely the question of whether Nature is ever doctored. As for those who hold to the third theory, Lewis claims that even this theory does not prevent the Supernatural from invading Nature:

If the laws of Nature are necessary truths, no miracle can break them: but no miracle needs to break them. It is with them as with the laws of arithmetic. If I put six pennies into a drawer on Monday and six more on Tuesday, the laws decree that—other things being equal—I shall find twelve pennies there on Wednesday. But if the drawer has been robbed I may in fact find only two. Something will have been broken (the lock of the drawer or the laws of England) but the laws of arithmetic will not have been broken. (Lewis, Miracles 92)

In particular, if the laws of nature state that the consequent B (12 pennies) follows from the antecedent A (6 pennies plus 6 pennies) and if a miracle occurs and the expected B is not observed, it is not that the laws of nature have been violated but simply that the antecedent is no longer A but is really A’. In other words, as long as nothing from outside of nature interferes, one expects the universe to obey these laws. If, however, something were to interfere, that would not be breaking the laws of nature, as those laws were never meant to account for such things.

What is the relationship between Reason (which follows from the laws of thought) and Nature (which demonstrates its own laws)? Lewis describes the connection by appealing to the mathematical idea of a relation that is “unsymmetrical” (Lewis, Miracles 39). A relation is simply a well-defined association between objects (people, animals, things, etc.) that is modeled mathematically by a set of ordered pairs. For example, suppose that Joe and Sue are siblings. Then “is a sibling of” is a relation and mathematically one would express the fact that “Joe is a sibling of Sue” is true by stating that the ordered pair (Joe, Sue) is in the relation. Clearly (Sue, Joe) is also in the relation as the statement “Sue is a sibling of Joe” is also true; thus the relation exhibits symmetry. If, on the other hand, the relation were defined by “is a sister of,” then the ordered pair (Sue, Joe) is in the relation; however, the ordered pair (Joe, Sue) would not be. Consequently the relation “is a sister of” lacks symmetry.

Lewis claims that an analogous asymmetrical relationship exists between Reason and Nature. Reason can act upon Nature to change it, but the reverse is not possible. For example, Reason can alter physical nature through the use of mathematics (e.g. bridges, air conditioning, engineering) and can alter psychological nature through arguments applied to our emotions. However, Nature has no such claim on Reason. When nature attempts to interfere with human consciousness, this simply is to produce Nature and to suspend Reason as “Nature is quite powerless to produce a rational thought: not that she never modifies our thinking but that the moment she does so, it ceases (for that very reason) to be rational” (Lewis, Miracles 38).

In several works, Lewis mentions the term “Flatlander.” The term is an obvious reference to the classic work Flatland by Edwin A. Abbott. The main character in Abbott’s book is A. Square, a “Flatlander” who lives in a two-dimensional world known as Flatland. Square lives a rather normal life in Flatland until he has a dream wherein he visits a one-dimensional world named Lineland. Square is unable to convince the inhabitants of Lineland that he is a creature not of their world but from a two-dimensional world. In an attempt to silence their disbelief, Square demonstrates how he can pass in and out of Lineland from a direction (upward) that they have yet to recognize. His display does not sway the residents of Lineland but instead
provokes them to violence. The following evening, Square is visited in his Flatland home by Sphere, a being from a three-dimensional world called Spaceland. Square learns from Sphere that he has been chosen to be the “Apostle of the Gospel of Three Dimensions” and is to receive his instruction from Sphere. However, just as the people of Lineland would not acknowledge the existence of two dimensions, Square initially rejects the existence of Spaceland and confuses Sphere with a Circle resident of Flatland. In the end, Sphere lifts Square out of Flatland in a direction (upward, not Northward) that Square has never acknowledged. The experience is truly a life changing one for Square, who afterward dedicates his life to evangelizing all of Flatland with the knowledge of the third dimension. Not surprisingly, his efforts are met with resistance and punishment.

Lewis suggests that Christians meet difficulties in their Faith that render them in ways like an inhabitant of Flatland trying to understand a solid object. Lewis writes these words:

A world of one dimension would be a straight line. In a two-dimensional world, you still get straight lines, but many lines make one figure. In a three-dimensional world, you still get figures but many figures make one solid body. In other words, as you advance to more real and more complicated levels, you do not leave behind you the things you found on the simpler levels: you still have them, but combined in new ways – in ways you could not imagine if you knew only the simpler levels.” (Lewis, *Mere Christianity* 142).

In particular, Lewis uses the correlation of dimensions as an analogy for the concepts of the Trinity, time and eternity, and temporal versus eternal existence.

The doctrine of the Trinity espouses the triune personality of one Being. Lewis compares this incomprehensible concept of one Being consisting of three Persons to the geometric fact that a cube is composed of six distinct squares yet remains a single cube: In God's dimension, so to speak, you find a being who is three Persons while remaining one Being, just as a cube is six squares while remaining one cube. Of course we cannot fully conceive a Being like that; just as, if we were so made that we perceived only two dimensions in space we could never properly imagine a cube” (Lewis, *Mere Christianity* 143). The quote contains a hidden reference to Abbott’s book. Elsewhere, Lewis is more explicit: “Flatlanders, attempting to imagine a cube, would either imagine the six squares coinciding, and thus destroy their distinctness, or else imagine them set out side by side, and thus destroy the unity. Our difficulties about the Trinity are of much the same kind” (Lewis, *Christian Reflections* 79-80). In contrast, Lewis comments that the Pantheist, even though he may claim a super-personal God, in actuality conceives of a sub-personal God “as though the Flatlanders thought a cube existed in fewer dimensions than a square” (Lewis, *Miracles* 136). Instead of a Being with a real character of its own, his God “becomes simply 'the whole show' looked at in a particular way or the theoretical point at which all the lines of human aspiration would meet if produced to infinity” (Lewis, *Miracles* 131).

Lewis proposes that God is not at all in the human timeline. God sits above, beyond in such a way that He does not experience a moment that has passed but rather experiences all moments as the present: “If you picture Time as a straight line along which we have to travel, then you must picture God as the whole page on which the line is drawn” (Lewis, *Mere Christianity* 148). So, time is one-dimensional and God is not confined to that single dimension. As for eternity, Lewis remarks, “If we think of time as a line—which is a good image, because the parts of time are successive and no two of them can co-exist; i.e., there is no width in time,
only length—we probably ought to think of eternity as a plane or even a solid. Thus the whole reality of a human being would be represented by a solid figure” (Lewis, *The Problem of Pain* 125). Eternity is depicted as at least two-dimensional when compared to one-dimensional time and the totality of human existence is seen as three-dimensional.

In exploring the relationship between temporal and eternal life, Lewis writes, “Suppose that the earthly lives she and I shared for a few years are in reality only the basis for, or prelude to, or earthly appearance of, two unimaginable, supercosmic, eternal somethings. Those somethings could be pictured as spheres or globes. Where the plane of Nature cuts through them—that is, in earthly life—they appear as two circles (circles are slices of spheres). Two circles that touched” (Lewis, *A Grief Observed* 24). Here, Lewis chooses the sphere as the solid to represent the full reality of human existence. The cross-section of that reality which is experienced in earthly life is symbolized by the figure of a circle. Moreover, his married life with Joy Davidman is portrayed as the intersection of their two individual circles. The analogy echoes the manner in which the figure of a square and the solid of a cube were used to illustrate the concept of the Trinity. What is more, the passage is reminiscent of Square’s failure to distinguish Sphere from a Circle in Flatland.

In the essay “Transposition,” Lewis puts forward the juxtaposition of a richer system to a poorer system to further explain the relationship between the spiritual life and the natural life. Lewis gives an example of the richer and poorer that is readily experienced, namely emotions and sensations. The emotional life is “richer” than the life of sensations because human nerves produce the same sensation to express more than one emotion. For instance, both joy and sorrow often yield tears. It is impossible to find a one-to-one correspondence between such systems and “the transposition of the richer system into poorer must, so to speak, be algebraical, not arithmetical.” (Lewis, *The Weight of Glory* 77) The most famous example, claims Lewis, is from the art of drawing:

The problem here is to represent a three-dimensional world on a flat sheet of paper. The solution is perspective, and perspective means that we must give more than one value to a two-dimensional shape. Thus in drawing a cube, we use an acute angle to represent what is a right angle in the real world. But elsewhere an acute angle on the paper may represent what was already an acute angle in the real world, for example, the point of a spear or the gable of a house. The very same shape which you must draw to give the illusion of a straight road receding from the spectator is also the shape you draw for a dunce's cap. (Lewis, *The Weight of Glory* 78)

Lewis states that to recognize the spiritual life one must approach this notion of Transposition from above “as we all do in the case of emotion and sensation or of the three-dimensional world and pictures, and as the spiritual man does” (Lewis, *The Weight of Glory* 81-2) otherwise one will reach incorrect conclusions. For without Transposition, the natural life will appear to be all there is. “The brutal man never can by analysis find anything but lust in love; the Flatlander never can find anything but flat shapes in a picture; physiology never can find anything in thought except twitching of the grey matter. It is no good browbeating the critic who approaches Transposition from below.” (Lewis, *The Weight of Glory* 81)

Lewis claims the principle of Transposition might also enlighten the doctrine of the Incarnation. In *Miracles*, Lewis perceives the Incarnation as God descending into humanity just
as the Supernatural descends into the Natural. Lewis states, “We catch sight of a new key principle—the power of the Higher, just in so far as it is truly Higher, to come down, the power of the greater to include the less. Thus solid bodies exemplify many truths of plane geometry, but plane figures no truths of solid geometry.” (Lewis, Miracles 178) Once again Lewis uses the concept of dimensionality to elucidate his ideas. In this analogy, the Divine Incarnation is as a proposition in solid geometry that generalizes this truth in plane geometry—humans exist as composite moral rational creatures, purely natural in many ways but nonetheless more than just natural beings. Conversely, just as no truths of solid geometry are revealed by plane figures, there remain facts beyond human comprehension: “I do not think anything we do will enable us to imagine the mode of consciousness of the incarnate God. That is where the doctrine is not fully comprehensible” (Lewis, Miracles 177).

Furthermore, Lewis offers that the principle of Transposition might illuminate the doctrine of the resurrection of the body. Lewis contends that the New Nature that is being created through the Son is interlocked in ways with the Old Nature, in a manner similar to the way that “some facts about a solid body are facts of linear geometry” (Lewis, Miracles 251) The New Nature might be able to perceive dimensions beyond what is now observed:

> It is useful to remember that even now senses responsive to different vibrations would admit us to quite new worlds of experience: that a multi-dimensional space would be different, almost beyond recognition, from the space we are now aware of, yet not discontinuous from it: that time may not always be for us, as it now is, unilinear and irreversible: that other parts of Nature might some day obey us as our cortex now does.” (Lewis, Miracles 250)

With the resurrection of Christ, “a wholly new mode of being has arisen in the universe,” (Lewis, Miracles 241) says Lewis, a body that belongs to the category of New Nature and that “is differently related to space and probably time, but by no means cut off from all relation to them” (Lewis, Miracles 241). As for the complete expression of redeemed humanity, Lewis proposes, “It is like when you throw a stone into a pool, and the concentric waves spread out further and further. Who knows where it will end?” (Lewis, The Great Divorce 106).

The two categories, firstly the relationship between mathematics and certain laws and secondly the employment of geometry and dimension, have been thoroughly examined. Yet, many more examples of the use of mathematics in the writings of C. S. Lewis could be given. To include all of the mathematical references in the corpus of Lewis would be difficult; however, this paper would be deficient if it did not give at least a sampling of what the Lewis reader would find in addition to what already has been evinced.

- Our experience in this world: “We are not living in a world where all roads are radii of a circle and where all, if followed long enough, will therefore draw gradually nearer and finally meet at the center: rather in a world where every road, after a few miles, forks in two, and each of those into two again, and at each fork you must make a decision.” (Lewis, A Grief Observed 10)
- Spiritual growth and maturity: “When you have learned to do quadratics and enjoy doing them you will not be set them much longer. The teacher moves you on.” (Lewis, A Grief Observed 49)
• Spiritual resemblance: “Take a parallel from an infinitely higher sphere.” (Lewis, A Grief Observed 65)

• Stumbling block in an argument: “But we need not delay over this which is the very pons asinorum of our subject.” (Lewis, The Abolition of Man 19)

• Perspective on progress and the advance of science: “Because we have to use numbers so much we tend to think of every process as if it must be like the numeral series, where every step, to all eternity, is the same kind of step as the one before....There are progressions in which the last step is sui generis – incommensurable – with the others – and in which to go the whole way is to undo all labor of your previous journey.” (Lewis, The Abolition of Man 86)

• Countering the argument against Christianity from the size of the universe: “For light years and geological periods are mere arithmetic until the shadow of man, the poet, the maker of myths, falls upon them.” (Lewis, Miracles 84)

• Miracles and religion: “Sometimes the credibility of the miracles is in an inverse ratio to the credibility of the religion.” (Lewis, Miracles 217)

• Comparison of goodness: “The Divine 'goodness' differs from ours, but it is not sheerly different: it differs from ours not as white from black but as a perfect circle from a child's first attempt to draw a wheel.” (Lewis, The Problem of Pain 30)

• Pain is not additive: “Suppose that I have a toothache of intensity x: and suppose that you, who are seated beside me, also begin to have a toothache of intensity x. You may, if you choose, say that the total amount of pain in the room is now 2x. But you must remember that no one is suffering 2x: search all time and space and you will not find that composite pain in anyone's consciousness. There is no such thing as a sum of suffering, for no one suffers it.” (Lewis, The Problem of Pain 116-7)

• More on the Trinity: “The Father eternally begets the Son and the Holy Ghost proceeds: deity introduces distinction within itself so that the union of reciprocal loves may transcend mere arithmetical unity or self-identity.” (Lewis, The Problem of Pain 156)

• Omnipresence of God: “God does not fill space as a body fills it, in the sense that parts of Him are in different parts of space, excluding other objects from them. Yet He is everywhere–totally present at every point in space–according to good theologians.” (Lewis, The Weight of Glory 46)

• Elements of a set: “In any book on logic you may see the expression "members of a class." It must be most emphatically stated that the items or particulars included in a homogeneous class are almost the reverse of what St. Paul meant by members.” (Lewis, The Weight of Glory 123)

• Value of the human soul: “The infinite value of each human soul is not a Christian doctrine. God did not die for man because of some value He perceived in him. The value of each human soul considered simply in itself, out of relation to God, is zero.” (Lewis, The Weight of Glory 127)

• Forgiveness: “When you start mathematics you do not begin with the calculus; you begin with simple addition. In the same way, if we really want (but all depends on really
wanting) to learn how to forgive, perhaps we had better start with something easier than the Gestapo.” (Lewis, *Mere Christianity* 105)

- Striving for moral perfection: “To be sure, perfect arithmetic is "an ideal"; you will certainly make some mistakes in some calculations. But there is nothing very fine about trying to be quite accurate at each step in each sum. It would be idiotic not to try; for every mistake is going to cause you trouble later on. In the same way every moral failure is going to cause trouble, probably to others and certainly to yourself.” (Lewis, *Mere Christianity* 69-70)

- Impersonal Being: “If it is pure impersonal mind, there may be no sense in asking it to make allowances for you or let you off, just as there is no sense in asking the multiplication table to let you off when you do your sums wrong. You are bound to get the wrong answer.” (Lewis, *Mere Christianity* 38)

- Absolute truth: “My argument against God was that the universe seemed so cruel and unjust. But how had I got this idea of just and unjust? A man does not call a line crooked unless he has some idea of a straight line.” (Lewis, *Mere Christianity* 45)

- Good and evil: “Good and evil both increase at compound interest.” (Lewis, *Mere Christianity* 117)

- Golden rule: “But then, has oneself anything lovable about it? You love it simply because it is yourself. God intends us to love all selves in the same way and for the same reason: but He has given us the sum ready worked out on our own case to show us how it works.” (Lewis, *Mere Christianity* 108)

- Importance of Christian fellowship: “That is why the Church, the whole body of Christians showing Him to one another, is so important. You might say that when two Christians are following Christ together there is not twice as much Christianity as when they are apart, but sixteen times as much.” (Lewis, *Mere Christianity* 164-5)

Through comparison and contrast, analogy and illustration, simile and metaphor, concepts and terminology, C. S. Lewis, in his apologetic writings, demonstrated a high regard for the discipline of mathematics. His admiration of the subject matter extended to praise for its practitioners. Mathematicians “propound mathematical theorems in beleaguered cities” (Lewis, *The Weight of Glory* 43) and contemplate “timeless and spaceless truths about quantity” (Lewis, *God in the Dock* 213). Elsewhere, he writes that “a mathematician's mind has a certain habit and outlook which is there even when he is not doing mathematics” (Lewis, *Mere Christianity* 77). Even though Lewis could not tame the lion mathematics, he was able to appreciate and articulate the beauty and power of the discipline he never mastered, and that is true genius.

Acknowledgements

The author gratefully acknowledges the paper (Neuhouser) as a major source of inspiration for this article. The author also wishes to thank Union University for its support of this research through the Pew Summer Research Grant program. Finally, the author wishes to
express gratitude to Dave Neuhouser, Hal Poe, and Kim Jongerius for their valuable comments and suggestions.

Author’s Note: A earlier version of this paper was given at the 7th Frances White Ewbank Colloquium on C. S. Lewis and Friends, Taylor University, June 2010, and appears in the proceedings (Lunsford) of that colloquium.
Bibliography


Patient Scheduled for Laparoscopic Cholecystectomy with Family History of Malignant Hyperthermia and Definitive Diagnosis of Carcinoid Syndrome: Case Report

By April Yearwood, CRNA, MSN, APN

This case report gives in detail the carefully planned anesthetic that was provided to a patient presenting for laparoscopic cholecystectomy and with previously diagnosed carcinoid syndrome and family history of malignant hyperthermia (MH). The combination of these two complicating factors posed a challenge in anesthetic management. Carcinoid syndrome is a complicated array of signs and symptoms caused by the secretion of vasoactive substances (histamine, serotonin, kallikrein) from carcinoid tumors mostly found in the gastrointestinal tract. Although rare, this syndrome, if not controlled, by itself poses a tremendous challenge to the anesthetist for even the simplest of cases. Malignant hyperthermia is a life-threatening syndrome that occurs from exposure of susceptible individuals to triggering agents, such as specific drugs, stressful environmental factors or alterations in the serotonergic system. The hypermetabolic crisis that evolves causes an abnormal release of calcium from a malfunctioning sarcoplasmic reticulum and can cause potentially fatal consequences. Herein lies the challenge of providing an anesthetic that is safe and nontoxic for the patient. This case report gives in detail the carefully planned anesthetic that was provided. It also poses a question for future research…Could serotonin be the common denominator between these two life threatening disorders?

KEYWORDS: Carcinoid syndrome, malignant hyperthermia, serotonin, histamine, carcinoid tumors.

A patient was scheduled for a laparoscopic cholecystectomy with a history of two very different disease processes: malignant hyperthermia (MH) and carcinoid syndrome. The patient in this review had both disorders, making it a very rare case. However, evidence could suggest a link between them. The first disorder is MH. Malignant hyperthermia is an autosomal dominant hypermetabolic disorder involving uncontrolled calcium release from skeletal muscle that causes potentially fatal consequences. The triggering agents for the hypermetabolic reaction are some anesthetics and depolarizing muscle relaxants, or extreme stress in the form of heat or exercise. Malignant hyperthermia activation or triggering leads to muscle rigidity, metabolic acidosis, hypercapnia, tachycardia, and fever. The second disorder is carcinoid syndrome. Carcinoid tumors are rare, slowly progressive tumors primarily found in the gastrointestinal tract. These tumors have the ability to secrete vasoactive peptides, mainly serotonin, which is responsible for cutaneous flushing, diarrhea, and bronchospasm, features referred to as the carcinoid syndrome. Several researchers have presented case reports of patients suffering from MH during exercise, heat, or excitement propose a human stress syndrome exists and this could be linked to alterations in the serotonergic system. ¹ If true, then serotonin could be the link that connects MH and carcinoid syndrome.
Case Report

The patient was a 47-year-old woman scheduled to undergo a laparoscopic cholecystectomy. Her medical history included hypertension, frequent headaches, rheumatoid arthritis, carcinoid syndrome with unknown location of tumors, stomach ulcers, and a family history of MH. Her symptoms of carcinoid syndrome included episodes of hypertension, night sweats, diarrhea, flushing, cyanosis, and cardiac arrhythmias. Her family history of MH involved her cousin and daughter, both experiencing a near death experience from anesthesia-related causes. The patient’s surgical history included hysterectomy, tonsillectomy, lymph node dissection, and two caesarean sections. She denied any history of anesthetic complications. The patient’s medications included nadolol, triamterene/hydrochlorothiazide, buspirone, paroxetine, and once a week an estradiol transdermal patch. Her history of allergies was x-ray dye, iodine, penicillin, and pseudoephedrine. She denied alcohol abuse or a history of smoking.

Upon admission the patient’s body weight was 86 kg and her height was 63 inches. The patient complained of multiple episodes of epigastric and right upper quadrant pain over the last five years, associated with nausea and vomiting, primarily after eating fatty or greasy foods. She denied dark urine or acholic stools. She had recently presented to the emergency room with these same symptoms. An ultrasound revealed evidence of gallbladder “sludge” and a CT scan of the abdomen and pelvis revealed granulomatous disease in the liver and spleen, but no other pathology. After deliberation of risks, alternatives and possible complications from the actual surgical procedure, from MH, and carcinoid syndrome, the patient, the surgeon and the anesthesiologist agreed to proceed with surgery.

The day prior to the surgery, preparations were made in the operating room (OR) to protect the patient from MH. A standby anesthesia machine was ‘flushed’ out with oxygen the night before. On the day of surgery, this anesthesia machine was taken to the OR, replacing the existing machine. The vaporizers were taped and secured to prevent them being turned on. The soda lime canisters were exchanged for new ones and a fresh circuit was placed on the machine. The MH cart was placed in the OR with a vial of dantrolene 20 milligrams mixed and ready for immediate use. Cooled intravenous solutions were readily available. All hospital staff having access to the patient was informed of her history and was on standby if needed.

Preoperatively, the patient was placed in the preop holding area; a peripheral intravenous (IV) line was started with an infusion of lactated Ringer’s. Preoperative vital signs included blood pressure (BP) 138/63, heart rate (HR) 104, respiration 24 per minute, temperature 98°F, and an oxygen (O2) saturation 96% on room air. Preoperative medications in the holding area included two grams of cefotetan IV, famotidine 20mg IV, and metaclopramide 10mg IV. A total of 7mg midazolam IV was titrated to effect to reduce her anxiety. Labetalol 10mg IV lowered her BP to 102/51 within fifteen minutes. The usual glycopyrrolate preop was not given due to potential masking effects of the heart rate that could indicate trouble intraoperatively.

Preoperative laboratory tests were within normal limits: sodium 139mmol/L, potassium 3.9mmol/L, chloride 104mmol/L, carbon dioxide 22mmol/l, BUN 10mg/dL, creatinine 0.7mg/dL, calcium 8.8mg/dL, hemoglobin 13.2g/dL, hematocrit 38.3%, and platelets 237nL and normal sinus rhythm on EKG with a rate of 92.

On arrival to the OR, the patient moved herself onto the OR table, where a cooling blanket had been placed. After monitor placement preinduction, vital signs were BP 130/72, heart rate 85, and O2 saturation 100%. The patient was preoxygenated with 100% oxygen via
facemask for three minutes. An induction dose of midazolam 10 mg was given. When lid reflex was absent, rocuronium 50 mg was given. The trachea was easily intubated with a 7.5-cuffed endotracheal tube (ETT) and a minimal occlusive pressure of 8 cc air was placed into the cuff. A Foley catheter and an oral gastric tube were placed and verified. Anesthesia was maintained with 100% oxygen, a propofol infusion per Bard pump at 125 mcg/kg/min as well as a remifentanil infusion at 1.5 mcg/kg/min for analgesia. The vital signs during laryngoscopy were BP 200/130, HR 108, and O₂ saturation 98%. Immediately after laryngoscopy, the vital signs were BP 150/90, HR 98, and O₂ saturation of 100%. The HR remained between 60 and 85 in normal sinus rhythm throughout the procedure as well as a systolic BP between 125-160 and a diastolic BP between 60-90. An esophageal stethoscope was placed to monitor temperature, which ranged 97.6° to 97.9°F throughout the surgery. The end tidal carbon dioxide remained at 31 to 34 mmHg. The surgery proceeded without difficulty with the titration of a total of 700 mcg remifentanil and 500 mg propofol to keep vital signs within the patient’s normal baseline level. Droperidol 0.625 mg was given prophylactically to prevent nausea. The patient had 4 out of 4 twitches with a train of four and a five second sustained tetanus to the facial nerve at the close of surgery; however, neostigmine 2mg and glycopyrrolate 0.2 mg were given to reverse any residual neuromuscular blocking effects. After discontinuing the propofol and remifentanil infusions, the patient’s oropharynx was suctioned and spontaneous breathing returned. She was extubated in the OR without incident.

The patient received a total of 1000 mL of lactated Ringer’s during the 75-minute procedure. Her normal maintenance IV fluid requirement per hour was calculated to be 126 mL per hour, and the deficit from an 8-hour overnight fast was estimated to be 1008 mL. The estimated blood loss was less than <50 mL.

On arrival to the post anesthesia care unit (PACU), the patient was awake without signs of distress and with normal vital signs. No apparent symptoms of MH or carcinoid syndrome were noted in PACU or on the telemetry floor after leaving PACU. Meperidine was ordered postoperatively for pain relief along with promethazine.

Postoperatively after 18 hours, the patient had no recall, no complaints of pain, and no signs or symptoms of any reaction from anesthesia. She was discharged the following day without complications.

Discussion

Carcinoid tumors consist of slow-growing malignancies composed of enterochromaffin cells found in the gastrointestinal (GI) tract. When these tumors secrete vasoactive substances, the result is carcinoid syndrome. A high number of carcinoid tumors are found in the appendiceal region and symptoms can be confused with acute appendicitis. Carcinoid tumors have also been found in the bronchi and rarely in the ovaries. Since most of the tumors are located in the GI tract, their metabolic products are released into the portal circulation and destroyed by the liver without systemic effects. However, the vasoactive metabolic products of non-intestinal tumors that exist in the pulmonary system, ovaries, or in hepatic metastases impairing the liver, bypass the portal circulation and cause a variety of clinical manifestations (carcinoid syndrome). Vasoactive peptides released from these tumors in the bronchi and ovaries produce a more rapid effect due to their direct drainage into the portal vein. Approximately 5% to 10% of persons with carcinoid tumors develop carcinoid syndrome.  

2,3
Carcinoid tumors in any location will secrete serotonin and may also secrete insulin, adrenocorticotrophic hormone, melanocyte-stimulating hormone, gastrin, glucagon, bradykinin, substance P, histamine, prostaglandins, vasoactive intestinal peptide, calcitonin, or numerous other substances. Carcinoid tumors are also functionally autonomous. Factors that enhance the release of these hormones include direct physical manipulation of the tumor and beta adrenergic stimulation.

The most common manifestations of carcinoid syndrome are cutaneous flushing, bronchospasm, profuse diarrhea, abrupt variations in arterial blood pressure, supraventricular dysrhythmias, anxiety, wheezing, salivation, lacrimation, hyperthermia, and facial edema. 2,4

Histamine release results in bronchoconstriction from contraction of airway smooth muscle. Tricuspid regurgitation or pulmonic stenosis represents a right sided valvular lesion that can result from valve cusp distortion produced by metastases from a carcinoid tumor. Valves on the left side of the heart are spared, which may reflect the ability of pulmonary parenchymal cells to inactivate vasoactive substances, especially serotonin. Persons with carcinoid syndrome have an increased incidence of supraventricular tachydysrhythmias and atrial premature beats.

Episodic cutaneous flushing initially involves the face and neck which may spread to involve the trunk and upper extremities. Bradykinin is a potent vasodilator that seems the most likely cause of cutaneous flushing. Abdominal pain and diarrhea are the results of increased serotonin levels. Hyperglycemia is also present and reflects the ability of serotonin to mimic the effects of epinephrine by stimulating glycogenolysis and gluconeogenesis. The actual diagnosis of carcinoid syndrome is confirmed by detection of serotonin metabolites in the urine.

The manifestations from carcinoid tumors have important implications for the management of anesthesia. The key is to avoid anesthetic techniques or agents that could cause the tumor to release vasoactive substances. Persons with carcinoid tumors may present in the operating room for primary resection of the tumor, for removal of hepatic metastases, or may require replacement of a heart valve. Preoperatively, octreotide (50mcg IV and 50mcg subcutaneously), a synthetic somatostatin analogue, should be given to block the effects of vasoactive substances and to inhibit ectopic hormone release. [5] Bouts of hypertension, tachycardia, hypotension, and bronchospasm have been reported in response to histamine release, exogenous or endogenous catecholamines, and stimuli such as preoperative abdominal scrubbing or succinylcholine-induced fasciculations. Pretreatment with a number of medications, including somatostatin, H1 and H2 blockers, and methyprednisone, which blocks prostaglandin synthesis, is advised. 4

The goal should be to keep the patient as stable and stress free as possible. No specific anesthesia technique has been proven superior. Preoperative preparation requires correction of depleted volume and electrolyte levels. Drug-induced histamine release should be avoided. Fasciculations resulting from succinylcholine may cause release of hormones and should be avoided. Ketamine, which may activate the sympathetic nervous system, should also be avoided since catecholamines are known to activate kallikreins. Hypotension may stimulate the release of substances; thus, it is important to consider the potential adverse effects of deep anesthesia and/or peripheral sympathetic nervous system blockade.
Malignant hyperthermia (MH) is a life-threatening syndrome that occurs from exposure of susceptible individuals to triggering agents, such as specific drugs or stressful environmental factors. It has been shown to occur as an autosomal dominant trait in families, as well as autosomal recessive or multifactorial. The gene for MH is located on human chromosome 19, which is also the genetic coding site for the calcium release channel of skeletal muscle sarcoplasmic reticulum (the ryanodine receptor). Problems with the ryanodine receptor are responsible for manifestations of this disorder in at least 50% of the people with MH.

Triggering agents for MH include all commonly used inhalational anesthetics and depolarizing muscle relaxants. Furthermore, in certain breeds of swine, MH can be easily triggered by environmental stress. Malignant hyperthermia unrelated to anesthesia rarely occurs in humans, however. There have been case reports of patients suffering from MH during strenuous exercise, excitement, and environmental heat, indicating the existence of a human stress syndrome. Serotonin, which is an important stress hormone, can be a trigger agent of MH in susceptible pigs. Furthermore, it has been found that serotonin levels in the plasma are significantly enhanced during halothane-induced MH. Therefore, it could be hypothesized that serotonin might also trigger MH in humans. But, there is still debate about whether stress-induced MH episodes are caused by an increased sympathoadrenergic activity, alterations in the serotonergic system, or genetic heterogeneity.

Treatment consists of early recognition and institution of a preplanned therapeutic regimen. All inhalation anesthetics are stopped, and the patient is immediately hyperventilated with 100% oxygen. The surgical procedure is stopped as soon as possible and active cooling is initiated. Dantrolene is the drug of choice during a crisis and should be administered early. This lipid soluble hydantoin derivative acts by inhibiting the release of calcium from the sarcoplasmic reticulum, therefore inhibiting muscle contractures induced by triggering agents and normalizing myoplasmic calcium concentration. The initial dose is 2.5mg/kg and may go up to 10mg/kg. Metabolic acidosis is corrected and urine output maintained at 1-2cc/kg/hr. Any cardiac dysrhythmias are treated and the patient is admitted to an intensive care unit for up to 72 hours, where urine output, arterial blood gases, pH, and serum electrolyte concentrations are closely followed.

Prior to surgery, a detailed medical and family history should be obtained with particular reference to previous anesthetic experiences. A family history of sudden unexplained perioperative death may be a strong indication to avoid the use of known triggering agents during surgery. Also, a history of the person’s response to physical exertion may be helpful. The physical exam should concentrate on the musculoskeletal and cardiac systems. The definitive test that determines if a patient has MH is a muscle biopsy in which an in vitro contracture test (IVCT) is administered; however, only those patients at significant risk are tested by invasive means. Those who do test positive for MH sensitivity should carry appropriate identification, such as a MedicAlert tag.

Conclusion

If a complication did arise during this anesthetic, such as a heart rate or a temperature increase, would it have been due to the patient’s carcinoid syndrome, from the underlying history of MH, or possibly light anesthesia? The determination of the cause would have been difficult. The patient had not been diagnosed per muscle biopsy (the only definitive test) for MH, but as
noted earlier, had a strong family history. Therefore, caution was necessary to prevent MH. The definitive diagnosis of carcinoid syndrome had been made, however, and precautions were taken to prevent exacerbation of this co-existing problem.

Another concern is the transfer of critical patient information from provider to provider, especially in the transition from the CRNA to recovery room nurse to the floor nurse. At a minimum, the nursing staff should be informed of the patient’s history, the signs and symptoms of each disease process, its manifestation, and the treatment if symptoms appear.

As mentioned previously, chemically mediated hyperthermia can be caused by serotonin syndrome that would produce symptoms similar to MH. Is this coincidental that serotonin is a precursor to carcinoid syndrome and has been found in high levels in a patient after having an MH episode? Could these two syndromes be linked in this way? Or, could this patient’s family history of MH actually have been an episode of carcinoid syndrome? Clearly, these questions cannot be answered at this time. It is known, however, that this person had a disorder in which signs and symptoms similar to MH would be exhibited—when vasoactive substances were released. In this patient, the carcinoid tumors were not found by repeated CT scans, although one report revealed a few small focal calcifications in the liver and spleen.

An extensive literature search revealed only one case report with a combination of these two disorders. It was a patient under anesthesia with a MH susceptibility and during the case, an undiagnosed ‘problem producing’ carcinoid was found. Clearly, further research is warranted on this subject by exploring the relationship of naturally occurring serotonin, to the disease of MH as well as carcinoid syndrome. The anesthesia provider should be aware that this relationship could exist and should take measures to detect and treat the disease processes. It is imperative that anesthesia providers be prepared to diagnose and handle an MH crisis and/or carcinoid syndrome in any situation.
References


Health Care Providers' Perceptions of Quality of Care: Spiritual Interventions and Medical Missions

By Shari D. Wherry, DNP, ANP-C and Brad Harrell, DNP, ACNP-BC, CCRN

Abstract

Background: Advance practice nurses and Registered Nurses provide care to patients while on medical mission trips. Care not only includes physical interventions but also spiritual interventions.

Purpose: The purpose of the project was to document and analyze the perceptions of health care providers in relation to spiritual interventions provided to patients on medical mission trips.

Design: This was a quantitative design.

Methods: A 29-question survey was developed using several methods of inquiry including 5-point Likert Scale and multiple-choice questions. Data was collected over a 2-month period via Survey Monkey on-line. Participants were invited to participate through on-line networks and communities (i.e. Facebook, Yahoo, Gmail, Doctors of Nursing Practice, and Tennessee Nurses Association).

Results: The sample was composed of 77 Registered Nurses who have participated in previous medical missions. Nurse Practitioners made up 59.7% of the survey respondents while 40.3% chose “Other” as their title (i.e. Registered Nurse, Nurse Educator, New NP, and DNP). More than 75% of the participants agreed that patients did better physically and mentally after spiritual interventions than without spiritual intervention at all.

Conclusions: The project findings suggest that one’s religious preference, including Christianity, is significantly related to his or her perception of how patients did physically and mentally after spiritual interventions while treated during a medical mission trip ($p = 0.023$).

Introduction

Human beings are acknowledged to have a spirit and mind regardless of their philosophical basis. The spirit and mind are form and fabric of the person and cannot be separated from the physical body. O’Brien (2004) states, “holistic nursing is supported by and alternately supports this intimate connection of body, mind, and spirit” (p. 3). The Joint Commission has recognized the importance of spirituality, religious beliefs, and traditions of individuals over the past decade (O’Brien, 2004). Mission trips, whether within the continental United States or in other countries around the world, often allow participants the ability to provide medical and spiritual care. This comprehensive approach brings an atmosphere of complete and total healing to the individual. Advance practice nurses and registered nurses are providing care to patients while on short-term medical mission trips. This places these nurses in a position to be an intentional instrument and an excellent extension of God’s healing hand.

A common paradox of the Christian faith is the notion of sacred versus secular. The division of the world into two seemingly different domains gives rise to many concerns for the
Christian health care provider. This paradox broadens the gray area of a missionary, especially when he or she is trying to offer a meaningful, yet operational definition for his or her own mission field. Is the mission field only in lands far away or is it where one serves God daily? There are doctors, nurses, lawyers, brick layers, janitors, secretaries, educators and pastors who serve in the mission field through their daily offices. There are others who are called to foreign locations for their mission field. The moral fortitude needed to carry oneself and maintain one’s Christian mission is truly an exercise of faith and a close walk with the spirit of God (Galatians 2:20). The mission field does not have boundaries, labels, or titles. Education, status, or social class does not restrict it. It holds no cultural, ethnic or racial identity. “Missions minded-ness” comes from being and living in Christ, and praying to receive the unique calling to appropriately fulfill that mission.

Each Christian enters the mission field every day regardless of his or her place or position. The perception of success in missions can be different for each person involved. Although perception rules in many social dynamics, such as court cases, first opinions and personal encounters, it is not absolute truth. One’s perception has to do with how one sees the world around them. Bedford states, “perception should change if an error in perception is detected” (1999, p.4). Harnad (2003) states that perceived differences can either be gradual or quantitative, like shades of one color or abrupt and qualitative that one sees in different colors (p.1).

Since the early 1800s when scientific research started emerging, there has been a separation of medicine and religion (Koenig, 2000). In the early 1900’s Koenig says, “there were fewer than five medical schools in the United states that taught students about the role that religion played in the lives of sick patients” (2000, p. 388). However, spiritual interventions in nursing care today are implemented in both palliative and psychiatric nursing. Basic educational knowledge supports the fact that some physical alignments are a direct result of mental or spiritual problems, such as stress. Integrating spiritual and physical treatment encapsulates the entire being, treating the spiritual as well as the physical. If spiritual interventions are perceived to improve patient care outcomes, then spiritual and medical integration for patients in both the mission field abroad and in daily health care settings should be integrated into care.

Although there was an abundance of literature found on spiritual interventions and health care, no information was found on the relationship between spiritual intervention and perceived patient care outcomes among health care providers while on medical mission trips. The need for literature on this subject and the evaluation of provider perceptions related to spiritual interventions were the driving forces behind this project. Therefore, the inherent purpose of this project is to document and analyze the perceptions of health care providers in relation to spiritual interventions provided to patients on medical mission trips.

Review of Literature

A review of the literature was conducted using PubMed, SAGE, CINAHL, and Medline. Key words searched were “spirituality,” “nurse practitioner,” “nurse,” “medical missions,” “perceptions,” “perspectives,” “health care provider,” “short-term missions,” and “quality of care.” More than 200 articles were identified. Perceptions have been studied in many disciplines; however, there was less information in the literature on the relationship between spiritual intervention with patients and perceived patient care outcomes among health care providers. Another literature search was conducted limiting the search years from 1994 to the present, and 30 articles were chosen for this literature review.
In an article by Martha Highfield (2009) spirituality has a very concrete meaning. Being spiritually effective in her mission translated into intense preparation, education of the culture, and implementation of a specific plan upon arrival. Pre-planning was intense and very specific. Educational efforts were broad and encompassed the language, culture, and customs. Highfield researched extensively and communicated with agencies that had knowledge of the locality and previous missionary efforts in the area. She was “prepared” for her mission endeavor.

The very idea of missions has been tossed around, revised, changed, and re-changed over the years. Martin Lee (2008) gives a refreshing glimpse on the history of missions. Is mission’s proclamation, social change, or an integration of both simultaneously? Do missions ignore the established regime or try to go around it? Lee promotes the idea that missions is really from God. It is God inspired and God motivated, and the church is only one of the channels that God uses in missions. God historically and presently “calls” people to His work. Lee presents this call in “five basic marks of mission.” To proclaim, to teach, to respond to human need, to seek transformation, and sustain and renew life on earth are the basic tenants of missions past and present (Lee, 2008).

Medical missions, once delegated to the professionally trained practitioners, are now being encompassed by entire families. The Johanson family contributed a medical doctor, a nurse, and two support staff, which were their college age children (Johanson, 2004). These young people fulfilled important roles—teaching, organizing, and providing logistic support for the success of a complex mission in Honduras for several days. The spiritual rewards were experienced on both sides of the mission experience.

George Robinson (2010) examines short-term missions in his article “Biblical Foundations for Short-term Missions.” He points to one key characteristic seen in the Book of Acts: “the Holy Spirit intended that the entirety of the community of Christ-followers be engaged in the mission of God” (p.7). There are many who see the Apostle Paul as the greatest missionary ever known in the church. Meece (1994) suggests that there are many forms of missionaries. He discusses Paul’s mission methodology and how he stayed in areas from 3 weeks (Acts 17:2) to 2 years (Acts 19:8, 10). Meece suggests that “Paul’s stay in a place was cut short by circumstances beyond his control” (1994, p. 213).

In a study by Randall Friesen (2004), data was collected to measure the “relative impact of short-term missions on the beliefs, attitudes, and behaviors of young adult mission participants” (p. 19). There were 116 participants, who were between the age of 18 and 30 years (female = 58.6%, male = 41.4%). The average age was 21 years. Friesen utilized both quantitative and qualitative methods for collecting data. Participants were given a Belief, Attitude and Behavior (BAB) survey prior to going on assigned missions, directly after they returned from their mission, and one year following their mission trip. The survey measured 3 Relational Spheres (God, Church, and World) in 24 Concepts. Short essay responses and interviews from the participants were also conducted and combined with the qualitative data results. Friesen found a correlation between the number of short-term mission experiences and degree of interest in future full-time mission work was very strong (P=.009)” (p. 11).

In a study by Reyes-Ortiz, Rodriguez, and Markides (2009), adult Latinos were surveyed to see if there was an association between “spiritual healing and attitudes of self-reported perceptions about the medical encounter” (p. S542). Data was collected through a cross-sectional telephone survey. There were 3728 respondents and the average age was 43.5 +/- 15.5
Reyes-Ortiz, Rodriguez, and Markides found that 73% (n=2707) of respondents felt that they “received excellent or good quality of medical care in the past 12 months” (2009, p. S544). Twenty-six percent (n=994) of respondents felt frustrated after their last visit with a doctor or other medical professional while 23% (n=871) felt confused. Six percent (n=217) said they had consulted a curandero (a healer/folk doctor/shaman) in the past. Reyes-Ortiz, Rodriguez, and Markides found that adult Latino patients sought out spiritual intervention by other means when the patient felt confused from information given to them during a visit with a medical professional. Reyes-Ortiz, Rodriguez, and Markides (2009) also found that “a better perception of quality of medical care was associated with lower odds of consulting a curandero,” odds ratio 95% confidence intervals: 0.83 (0.70–0.98) (p. S544).

In another study by Cavendish et al., “nurses’ spiritual perspectives as they relate to education and practice” were examined (2004, p.203). The research design included a questioner and a descriptive qualitative content analysis. A random sample including 1000 members from the Sigma Theta Tau International Nursing Honor Society was asked to participate. Fifty-five percent (N = 545) of the members responded. The ages of the participants were between 21 and 61 years. More women (n = 533, 97.8%) responded to the questioner than men (n = 11, 2%). Eighty-one percent (n = 442) of participants had completed a Bachelor of Science (B.S.) degree while 19% (n = 103) had education past a B.S. degree. Nearly all participants (n = 541, 99%) reported a religious affiliation. Participants were asked to complete a 10-item Spiritual Perspective Scale (SPS) that was created by P.G. Reed in 1986. The SPS “measures an individual’s spiritual perspective to the degree that spirituality permeates one’s life and how one engages in spiritually related interactions” (Cavendish et al, 2004, p. 204). The study found that nurses with a religious association had higher SPS scores than nurses with no religious association, F (5.535) = 17.689, p = .001 (Cavendish et al, 2004). In 2001, Dr. Susan Stanahan looked at the relationship between “spiritual perceptions, attitudes about spiritual care, and spiritual care practices in nurse practitioners” (p. 90). All nurse practitioners (269) licensed in the state of Indiana were asked to participate. Reed’s SPS and the Nurses Spiritual Care Perspective Scale (NSCPS) tool, which was modified from the Oncology Nurse Spiritual Perspectives Scale (ONSPS), were sent to each prospective participant along with a demographic sheet. Forty percent (N = 102) of nurse practitioners surveyed returned the questionnaires. “The mean age of respondents was 50 years with a standard deviation of 11” and 95% (n = 97) were female (Stanahan, 2001, p. 95). Using the SPS tool, Stanahan found that the nurse practitioners surveyed indicated a moderately high degree of perceived spirituality, M = 4.98 with a SD = 1.1. There was also a significant correlation between the SPS and nurse practitioners’ responses to “frequency of attending religious services” r (100) = .426, p < .001 and “response to the question how religious are you”, r (100) = .433, p < .001 (Stanahan, 2001, p. 96). Of the 12 questions on the NSCPS, the most frequently practiced intervention by nurse practitioners was praying with the patient privately (42.9%).

Cavendish et al (2004) and Stanahan (2001) conducted similar studies. Both studies looked at nursing spiritual perspectives and utilized the SPS tool to gather data. Cavendish et al (2004) and Stanahan (2001) found that nurses with a religious affiliation had a higher degree of perceived spirituality, compared to those with no religious affiliation. While only 19% of participants in the Cavendish et al (2004) study had education past a B.S. degree, all participants in the Stanahan (2001) had education past a B.S. degree.
Andrews, Burr, and Busby (2010) published a narrative analysis article looking at nurses’ perceptions on quality of care in a medical-surgical setting. Data was collected from 308 registered nurses caring for medical-surgical adult patients in a large hospital located in the Southeastern United States as part of a larger study. Participants were invited to provide addition comments. One hundred and six written additional comments were collected. There were a total of 173 comments that were categorized into 1 of 12 themes. The majority of registered nurses (RN) who provided written comments were “female (n = 100, 95.3%), Caucasian (n = 78, 67%), and older than 40 (n = 65, 61.3%) (Andrews, Burr, and Busby, 2010, p. 2). Forty-three percent (n = 46) had an associate degree in nursing while 41.5% (n = 44) held B.S. degrees. There was a perceived lack of respect by RN respondents and 25% (n = 27) reported there was “lack of support from direct and indirect nursing supervisors and a failure to involve staff nurses in decision making” (Andrews, Burr, and Busby, 2010, p. 4). Twenty percent (n = 21) of respondents perceived that physicians created a negative and hostile working relationship, causing interference with the nurses’ ability to provide quality care for their patients. Respondents also listed lack of time as a concern (n = 24, 25%). They believed that “quality and patient outcomes were compromised because of lack of time related to heavy workloads and the additional tasks assigned to them” (Andrews, Burr, and Busby, 2010, p. 5). Although the Andrews, Burr, and Busby study did not specifically address “spiritual interventions,” it did shed light on some very important “in house” issues: physician/nurse working relationships and nurse workload. These issues are fundamentally important to the implementation of any effort to integrate spiritual interventions in the workplace.

In 2006, a comparison study was published “exploring healthcare staff’s perceptions of the quality of hospital care provided in the United Kingdom (UK) with the United States (US)” (McKenna, Keeney, Currie, and et al., p.344). A tool was developed by two UK research teams to replicate The US Perception of Unit Quality (PUQ) scale and the two tools were compared with each other. McKenna, Keeney, Currie, and et al. found that in both tools “communication between staff and between staff and patients was reported as important for quality of care” (2006, p. 347). Respondents from both the UK and the US also perceived that “good discharge procedures influenced quality of care” (McKenna, Keeney, Currie, and et al., 2006, p.349).

Andrews, Burr, and Busby (2010) and McKenna, Keeney, Currie, and et al. (2006) looked at healthcare staff’s perceptions of quality of care among patients. Both studies were hospital based and utilized comments from the participants. However, each study varied in its approach to disseminate data findings. Andrews, Burr, and Busby (2010) took written comments and categorized them into numerical data that could be analyzed for statistical significance. McKenna, Keeney, Currie, and et al. (2006) only gave a table comparing the UK and US clinical staff’s comments on quality of care.

There have been numerous studies on perceptions in healthcare and psychology journals. There have also been numerous studies on quality of care in conjunction with patients. However, there has been less research conducted on the relationship between spiritual intervention with patients and perceived patient care outcomes among health care providers.

Spiritual intervention produces observable and/or perceived changes in the patient that affect his or her quality of health. Religion and spirituality are important aspects of many cultures. When a patient becomes morbidly ill, he or she is often looking to spiritual answers for complex questions and medical realities that he or she has never sought before. Religion and spiritual beliefs of the patient may determine his or her medical choices (Dunkin and Dunn, 2009).
Koenig & Cohen claim spiritual factors help “persons cope with pain, anxiety and disability of medical illness” (2006, p. 1157). Dr. Jeff Levin concluded in a review of prayer research that worship and prayer had positive healing effects on individuals (2001). Spiritual comfort, solace, and intervention should be readily available when providing medical care to patients either in the mission field locally or abroad.

In a 2003 article, Dr. E. Taylor discusses clinical issues and implications of including prayer in bedside nursing. She says that nursing is about “assisting patients to cope, to adjust emotionally, and to be comforted” (Taylor, 2003, p. 180). Prayer is a spiritual intervention that nurse practitioners can offer in the mission field either locally or abroad. The nurse practitioner is truly dealing with body, soul, and spirit in the mission field. This holistic approach produces positive effects for the patient. Ultimately, to a Christian believer, spiritual intervention is the only factor that can bring comfort while dealing with their own mortality.

Many studies have examined nursing perspectives i.e. End of life issues, newborn care in ICU, patient safety, and quality of life (Reinke, Shannon, Engelberg, Young, and Curtis, 2010; Walsh, McCullough, and White, 2006; Hamric and Blackhall, 2007; Badir and Herdman, 2008; Kane, Rockwood, Hyer, et al., 2006). However, studies specifically related to spiritual intervention and medical missions were not readily available through the search engines used in this project. Therefore, the purpose of this project is to document and analyze the perceptions of health care providers in relation to spiritual interventions provided to patients on medical mission trips, in hopes that results can be united with other studies already existing or future examinations of this topic.

**Methods**

**Ethical Issues**

Consent to conduct the project was first obtained from the Union University DNP Nursing Committee. Approval by the Union University Institutional Review Board (IRB) was obtained prior to data collection and release of the project survey. Survey Monkey, an on-line electronic survey tool, was used to collect data. Informed consent was given anonymously online prior to participation in the survey. Anonymity was further protected by blocking access from the project designer to the IP addresses prior to release of the project survey. Confidentiality and privacy were maintained at all times during the data collection process, and there were no risks associated with participation in this project.

**Setting**

Requests for volunteer participation were sent to Nurse Practitioner Groups and Organizations, Registered Nurse (RN) Groups, Medical Groups, and Mission Groups through on-line networks and communities (i.e. Facebook, Yahoo, Gmail, Doctors of Nursing Practice, and TNA). The survey collected responses for two months in the fall of 2010 and the potential participant pool was approximately 20,000. Every two weeks, a request for participation was posted online or sent out via e-mail through discussion boards. A total of 124 people consented to participate in the project survey. Eighty-six participants completed the survey. A subset of these 86 participants was constructed by filtering their occupational responses as RNs decreasing the total number of participants to 77. This subset was used in all following analyses.
Methods of Evaluation

This was a quantitative project. A descriptive design was used to evaluate data. A 29-question survey was developed by the project designer using multiple-choice, yes/no and 5-point Likert Scale questions. The Question Understanding Aid from the University of Memphis (Quaid Tool) was used to assist the designer with improvement of the wording, syntax, and semantics of project survey questions.

Analysis

The data were analyzed by performing a Chi Square test and then symmetric measures were performed to see if there was any significant relationship. This analysis investigated whether providers felt that spiritual interventions actually changed providers’ perceived care. The demographic data were evaluated by performing measures of central tendency.

Results

One hundred and twenty-four individuals participated in this project. However, only 86 (69.4%) participants completed the entire survey. A sub-category to filter responses based on RN status was completed, decreasing the total number of participants to 77. Therefore, only RN’s who completed the entire survey are included in the present analysis.

Of the 77 participants, 69 (89.6%) were female and 8 (10.4%) were male. Sixty-two participants were Caucasian, seven were Asian, three were African American, one was Hispanic, and four categorized themselves as “Other.” Nurse Practitioners made up 59.7% of the survey respondents while 40.3% chose “Other” as their title. “Other” responses ranged from Registered Nurse, Nurse Educator, New NP, to DNP. Twenty-seven percent (n=21) of respondents were between the age of 21 and 39. Twenty-six percent (n=20) were between the age of 40 and 49. Forty-seven percent (n=38) were over the age of 50 with 37.7% (n=29) falling between the age of 50 and 59 years.

Participants were asked to choose one or more practice sites where they see patients on a regular basis. More than half (57.1%) of the respondents practice in a hospital setting while 48.1% said they practice in a clinic or office setting. When asked if this was their first mission trip, 26 (33.8%) responded yes. Seventy-one respondents (92.2%) said they plan on participating in another mission trip.

A Chi Square test was performed using each category response from the 5-scale Likert responses in question 17 (see Table 1). Each category response was compared to 5 demographic questions and 6 basic questions (see Table 2). Symmetric measures were performed to see if there was any significant relationship with how participants answered question 17 in comparison with how they answered all 11 questions.
Table 1 - Question 17 (n = 77)

<table>
<thead>
<tr>
<th>Answer Options</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
<th>Rating Average</th>
<th>Response Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients did better physically and mentally after spiritual interventions during my last medical mission trip.</td>
<td>1.3% (1)</td>
<td>3.9% (3)</td>
<td>28.6% (22)</td>
<td>44.2% (34)</td>
<td>22.1% (17)</td>
<td>2.18</td>
<td>77</td>
</tr>
</tbody>
</table>

Table 2 - Survey Tool (n = 77)

1. Please choose your age group.  
   - 21 to 29  
   - 30 to 39  
   - 40 to 49  
   - 50 to 59  
   - 60 years or older

2. Please choose your gender.  
   - Male  
   - Female

3. Please choose your ethnicity.  
   - African American  
   - Asian  
   - Caucasian  
   - Hispanic  
   - Other

4. How many years have you been a health care provider?  
   - 1 to 2 yrs  
   - 3 to 5 yrs  
   - 6 to 10 yrs  
   - 11 to 15 yrs  
   - > 16 yrs

5. Please choose your title.  
   - Nurse Practitioner  
   - Medical Doctor  
   - Physicians Assistant  
   - Other

6. Do you see patients/residents at (check all that apply)?  
   - A Clinic or Office  
   - A Hospital  
   - An Assisted Living Facility  
   - A Long Term Care Facility

7. Do you have a religious preference?  
   - Yes  
   - No

8. If you answered yes to question 7, what is your religion?  
   - Christianity  
   - Islam  
   - Hinduism  
   - Buddhism  
   - Judaism  
   - Other
For each item in this section, please answer Yes or No and please refer to your most recent involvement in missions work.

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Was this your first mission trip?</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Do you plan on participating in another mission trip?</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Do you plan on going on another mission trip in the next 2</td>
<td></td>
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</table>

**Discussion**

A health care provider’s individual perspective on spiritual care and spiritual intervention during medical missions has an impact on the provider’s perceived outcome of care. The project findings suggest that spiritual interventions were perceived as beneficial by those with over 10 years of experience (n=59, 76.6%) and in their mid-life (n=56, 72.8%). This maturity is supported by the fact that all the participants were actively engaged in clinical health care. Their professional problem-skills were sharpened along with their spiritual perception of spiritual intervention and health care.

Health care providers are put into a daily dilemma of providing or not providing spiritual care. However, one must understand the role that spirituality and religion plays in the everyday life of a patient and his or her family. Providing spiritual interventions is not a judgment or value call, but another component of the patient that completes his or her holistic care.

Over 90% of participants in this project identified with Christianity. The Cavendish et al (2004) and Stanahan (2001) studies parallel with this project in some of their basic findings. Both this project and the two studies significantly identified that a religious affiliation was basic to a higher perceived spirituality. However, this project sought to identify specific religious affiliations (i.e. Christian, Muslim, Jewish, Hindu and Buddhist) whereas the study by Stanahan (2001) looked at frequency of attendance to a religious service.

The Andrews, Burr, and Busby (2010) study looked at nurse’s perceptions of quality of care while this project looked at the perceived patient care outcome by healthcare providers after spiritual interventions.

**Limitations**

Several limitations of this project are noted. The principal investigator developed the survey tool used in this project so bias could be a confounding factor. The project represents the views of mostly Christians who volunteered to participate in the on-line survey and may not represent the views of non-Christians who have participated in medical mission trips previously. One factor that limits the ability to generalize the research data findings to the nursing profession is the small sample size. Limiting the request for participation to only a small number of social networking arenas was also a limitation and consequently the project designer was not aware of the actual pool of medical professionals being asked.
Interpretations

The project findings suggest that one’s religious preference to Christianity is positively related to his or her perception of how patients did physically and mentally after spiritual interventions during his or her last medical mission trip ($p = 0.023$). Furthermore, the findings suggest that there is a positive relationship between those who said they would go on another mission trip and their perception of how patients did physically and mentally after spiritual interventions during their last medical mission trip ($p = 0.009$).

The Chi Square data analysis suggests that there is a significant difference in what was observed and what was expected when comparing the various categories in question 17 and with questions 1 through 5. However, there was no relationship found between providers’ perception of how patients did physically and mentally after spiritual interventions during their last medical mission trip and the providers’ age ($p = 0.326$), gender ($p = 0.164$), ethnicity ($p = 0.644$), how many years they have practiced ($p = 0.922$), or their title ($p = 0.140$).

Conclusions

The purpose of this project was to document and analyze the perceptions of health care providers in relation to spiritual interventions provided to patients on medical mission trips. Christian values and beliefs were at the core of the participants’ philosophy. However, age, gender, ethnicity, and years of clinical experience did not establish measureable attitude perceptions in relation to spiritual interventions. Future studies with a larger pool of participants are suggested. Adding open-ended questions and conducting a pre and post medical mission questionnaire would be of more value statically than a onetime questionnaire. Some medical missions are a onetime event while other medical missions are daily events in one’s daily life. This would also be important to know in future studies because people who perceive their clinical environment to be “missions” might tend to draw on their daily experiences.

Registered nurses and NPs are ideally positioned to implement such studies and provide further information and education necessary to equip the body of nursing knowledge that is already in place. Mira (2004) states, “Spirituality is the core of what it means to be human, and includes multiple dimensions” (p.29). Patients do not need to have a crisis in their life before spiritual interventions are implemented. Therefore, spiritual interventions need to parallel the health care that patients receive from the first time they enter into the health care system and continue throughout their health care experience.
References


Identifying the Association Among Risk Factors and Mortality in Trauma Patients with Intra-Abdominal Hypertension and Abdominal Compartment Syndrome

By Bradley R. Harrell, DNP, ACNP-BC, CCRN and Sheila D. Melander, DSN, ACNP, APRN, BC, FCCM, FAANP

Keywords: abdominal compartment syndrome, abdominal compartment syndrome physiopathology, intraabdominal pressure, intraabdominal pressure classification, intraabdominal pressure evaluation, intraabdominal pressure physiology

Introduction/Background

Abdominal compartment syndrome (ACS) has increased in significance in the literature over the past decade, but only recently have guidelines and definitions been put into place. Many have suggested assessment and treatment of ACS despite the lack of a specific treatment guideline. In 2006, the World Society of the Abdominal Compartment Syndrome (WSACS) created consensus definitions and recommendations for treatment of those with intra-abdominal hypertension and abdominal compartment syndrome.

Intra-abdominal pressure (IAP) has been of interest to health care providers since the 19th century (1). Many studied the relationship of intra-abdominal pressure in animals to effects on respiration, organ function, and urine output (2, 3). In the 1950s, findings were associated with improper closure of the abdomen after surgery with air trapping within the abdomen (pneumoperitoneum) causing an increase in intra-abdominal pressure (4). ACS was largely overlooked until the 1980s when Kron, et al. (5) coined the phrase 'abdominal compartment syndrome' and identified measurement techniques for assessing IAP.

The pathophysiology of ACS includes recognition of the peritoneal cavity with visceral contents as a closed compartment; therefore, effects of extrinsic and intrinsic variables directly affect the pressure gradient within that closed compartment. The peritoneal compartment can be described as more rigid with the costal arch, spine, and pelvis as its boundaries or more flexible with the abdominal wall and the diaphragm as its boundaries (6). Extrinsic variables affecting IAP include pressure occurring outside the abdominal wall, including abdominal burn eschar, third-space edema, or military anti-shock trousers. Intrinsic variables include solid organ volume, hollow viscera volume, ascites, blood, fluid, gravid uterus, or tumors within the abdominal cavity (6). The IAP is measured by several different methods, yet intra-vesical (urinary bladder) pressures are considered most efficient and cost-effective (6-18). The abdominal perfusion pressure (APP) is a measure of visceral organ perfusion. The IAP is subtracted from the mean arterial pressure (MAP) to obtain the APP. Abdominal perfusion pressure is a more accurate predictor of abdominal organ perfusion and a more effective guide for resuscitation measures. Cheatham et al. (19) concluded that an APP of 60 mmHg in patients with ACS was 98 percent sensitive in predicting survival compared to an APP of 40 mmHg being 70 percent sensitive in predicting survival in a population largely comprised of trauma patients (68%, N=144). The study also concluded that APP is a more accurate predictor of resuscitation (p=0.0001) than arterial lactate (p=0.0002), MAP (p=0.0004), arterial pH (p=0.03), base deficit (p=0.04), or IAP
An ideal APP is anything greater than 60 mmHg. According to the consensus definitions, ACS is a sustained IAP greater than 20 mmHg (with or without APP < 60 mmHg) and is associated with new organ dysfunction (6). ACS is classified as either primary or secondary. Primary ACS occurs from within the abdominal compartment and is frequently associated with abdominal trauma, aortic trauma, acute pancreatitis, intra-abdominal hemorrhage, or liver transplant (6). Secondary ACS occurs due to conditions outside of the abdominal cavity. Common causes of secondary ACS include trauma-related cases with thoracic and/or extremity vascular injury and hemodynamically unstable pelvic fractures (20). In this study, patients from a level one trauma center were examined. The sample included those with either blunt or penetrating abdominal trauma.

The identified area of improvement for this project was to determine whether certain risk factors for ACS are independently associated with increased mortality. Although the list of risk factors is rather comprehensive, the risks most likely associated with a trauma population are evaluated in this study. Risk factors considered include large volume resuscitation (> 3.5 liters/24 hours); acidosis (pH < 7.2); hypothermia (core temperature < 33 C); coagulopathy (platelets < 55,000/mm3 or activated partial thromboplastin time two times normal or prothrombin time <50% or international standardized ratio > 1.5); polytransfusion (> 10 U packed red blood cells/24 h); sepsis; and/or intra-abdominal infection/abscess. (14, 15, 21-25). Because associated mortality is as high as 100% in patients who are diagnosed with ACS, it is beneficial to identify accurate risk factors and their association with mortality. ACS is a cause of increased mortality in the ICU. ACS is associated with increased lengths of stay, higher costs of care, and further development of multiple comorbidities (9, 11, 13, 14, 22, 24, 25).

Intended improvement. This project intends to explore an association between specific risk factors for abdominal compartment syndrome and mortality. Trauma patients with certain risk factors have an increase in mortality associated with ACS. Identifying this risk factor early on and preventing or decreasing its occurrence may lead to improved patient outcomes and a decrease in associated mortality.

Relevance. The World Society of the Abdominal Compartment Syndrome (WSACS) released a guideline in 2007 outlining the consensus definitions and treatment recommendations for ACS (11). ACS nearly doubles the risk (risk ratio of 1.85, 95% CI) of mortality in intensive care unit (ICU) patients (14). Clearly, a need exists to evaluate specific risk factors for developing ACS (11, 22, 25). Because abdominal compartment syndrome carries such a high risk of death, WSACS identified the specific definitions of abdominal compartment syndrome and identified common risk factors in developing this complication. In this study's setting, no written criteria or standard exists for evaluating a patient for ACS. Providers rely on clinical knowledge and assessment to assess for signs and later diagnose ACS. The literature interestingly states that physical assessment is non-specific for diagnosing ACS (9, 18). In practice, abdominal compartment syndrome is not easily assessed during physical exam. Invasive monitoring must be performed in order to obtain an accurate diagnosis. The two-fold increase in mortality and the difficulty associated with diagnosing ACS indicates a need for prompt attention focused at early identification and prevention. By identifying the risk factors most causative of death in this population, we can increase the awareness of these risk factors and alleviate or altogether prevent ACS from occurring. Abdominal compartment syndrome in the trauma patient population has been evaluated in the literature for quite some time. Perhaps
ACS is more common and therefore a greater risk for mortality in this specific population (11, 27-36).

Study question. In trauma patients at risk for developing ACS, does an association exist between specific risk factors and associated mortality? Additionally, this study purports that if a risk factor is highly associated with mortality, then measures may be implemented to prevent that one risk factor from occurring and therefore decrease the associated mortality.

Methods

Ethical issues. This study includes data collected through retrospective chart review and database query. The study gained full Institutional Review Board approvals by both the participating university and medical center. Multiple meetings were conducted with medical, nursing, informatics, and research administration and staff to maintain the integrity of the study and client privacy. Privacy was strictly maintained through diligent adherence to privacy standards and laws, and by maintaining a database without any identifiable patient information. The authors of this study have no conflicts of interest in either practice or academic settings as they relate to this study. Both authors remained free from conflict of interest throughout the conduct and writing of this report.

Setting. An urban level one trauma center serving six states with over 2,000 visits per year was the setting for this retrospective quality improvement initiative. The trauma center population includes patients in the trauma emergency/assessment areas, trauma intensive care units, trauma step-down units, and medical/surgical floors. Occasionally, a trauma service patient was admitted to a general intensive care unit and was followed there during the time of this study. Although a specific nursing standard of care exists for measuring IAP, no criteria exist for evaluating whether or not IAP should be measured on the provider or nursing staff level. The most common prompt to assess IAP is by provider order or request secondary to suspicious clinical examination. Because no specific criteria are in place to initiate the provider or nursing staff to measure IAP, perhaps many cases go unnoticed due to provider or nursing assessment error. Due to this lack of sensitivity to risk factors and this particular population being at particularly high risk for developing ACS, an evaluation of risk factors is necessary. The trauma patient population is significantly affected by ACS (11, 27-36). By identifying the risk factors that are specific to this population, perhaps enhanced identification of risk will increase the threshold for further assessment and measurement of IAP and therefore reduce ACS-associated mortality.

Population. All patients admitted into the trauma center between January 1, 2004 and February 28, 2009 who were medically diagnosed with ACS were included in this study. A diagnosis of ACS was determined by clinical suspicion by physical exam of non-compressible abdomen, mechanism of injury, new organ failure, and intra-abdominal pressure. A trauma database maintained by the trauma center was queried to obtain patients with a medical diagnosis of ACS. Originally, 126 patient records were identified. After detailed chart review, 88 met inclusion criteria for this study. The inclusion criteria were that a diagnosis of ACS was present on the chart and that an IAP was measured via bladder technique. Exclusion criteria were pregnancy, bladder trauma, and age < 14 years. All data were collected retrospectively. Nine records had no documentation of ACS. The remaining 38 had records unavailable for review at the time of this study.
Design. This project was retrospective and non-experimental in design. Chart reviews were conducted by the principal investigator only and were ongoing for the period of two months. Both paper and electronic records were available and reviewed. The chart review process was created and remained consistent during all episodes of review. A diagnosis of ACS was identified by the chart’s coding face sheet and documentation in the progress notes section of the chart. Once the diagnosis was identified, the first documentation of ACS in the progress notes without prior mention was considered the initial episode. These episodes ranged in time from immediately upon admission up to several weeks after. IAP measurements were obtained through provider progress notes or through nursing documentation correlating with the date and time of the initial diagnosis. Because subsequent measures were not consistently available, only the initial IAP measurement was included and subsequent measurements were not considered.

The diagnostic values used for calculating the APACHE IV scores were the ones closest in time either immediately prior to or after the IAP measurement or ACS diagnosis was documented. The amount of fluid resuscitation was determined from the medical record and reflected the liters of fluid administered within 24 hours prior to an ACS diagnosis or IAP measurement. The lab value to determine acidosis was the arterial pH and was obtained from values provided within 24 hours prior to an ACS diagnosis. Recent studies have similarly examined the relationship of risk factors for abdominal compartment syndrome. Common risk factors in all studies included acidosis, hypothermia, polytransfusion, coagulopathy, sepsis, bacteremia, intra-abdominal infection/abscess, peritonitis, liver dysfunction, mechanical ventilation, use of positive end-expiratory pressure (PEEP), pneumonia, abdominal surgery, massive fluid resuscitation, gastroparesis, gastric distention, ileus, volvulus, hemoperitoneum, pneumoperitoneum, major burns, major trauma, high body mass index, intra-abdominal or retroperitoneal tumors, prone positioning, massive incisional hernia repair, acute pancreatitis, distended abdomen, damage control laparotomy, laparoscopy with excessive inflation pressures, and peritoneal dialysis (6).

Due to only the recent publication of a consensus definition of ACS, the prevalence, risk factors, and associated mortality have varied widely (37). Three large prospective trials sought to determine the most common independent risk factors for developing ACS (27, 28, 38). With over 75% of the sample in these three studies being trauma patients, the most common risk factors for developing ACS were massive fluid resuscitation, abdominal surgery, ileus, lactate level, hypothermia, acidosis, anemia, and gastric carbon dioxide measurements. Similar to these studies, this retrospective review included IAP measurement, considered comorbidities, examined APACHE scores, and examined ACS risk factors as an independent predictor of mortality. However, none of these studies sought a relationship between any one risk factor and its effect on mortality. In essence, this study seeks to prove an association between a risk factor for developing ACS and mortality associated with it.

Data obtained for this study included points from the trauma registry database and by thorough hands-on chart review conducted by the principal investigator. Data were entered into an Excel spreadsheet and statistics were performed. Data points collected included the documented presence of a diagnosis of ACS, IAP measurement, date of admission, mechanism of injury, whether blunt or penetrating trauma, age, race, sex, height, weight, emergency department (ED) Glasgow Coma Score (GCS), admission hematocrit, lactic acid level, total units of blood received during hospital stay, blood alcohol levels, presence of abdominal packing, reopening of abdomen, laparotomy, whether or not injuries to the kidney, liver, or spleen were operable, abdominal mesh closure, temporary abdominal closure, number of intensive care unit (ICU) days, discharge date, and discharge disposition, including whether or not the patient
survived. Further scores used in examination include Acute Physiology and Chronic Health Evaluation IV (APACHE IV) as a predictor of mortality.

Analysis. The methods used to analyze data in this study included computerized statistical software. Excel and SPSS were the programs used to analyze data. Pearson’s coefficient was used to show correlation and is reported as r. A large positive correlation is considered a r value of 0.5 to 1, medium positive correlation is 0.3 to 0.5, and a small positive correlation is 0.1 to 0.3. Student’s t-test was used for showing statistical significance with a p value less than 0.05 being significant with a confidence interval of 95% and all t-tests being two-tailed. The relative risk (RR) was calculated using pivot tables within Excel and then calculating the relative risk from an online two-by-two contingency table calculator. If RR is less than or equal to one, then there is no association between the risk factor and mortality. If the RR is greater than one, then there is a positive association and could indicate that a risk factor is a cause for mortality.

Results

Eighty-seven subjects were included in this study, and all had the complication of abdominal compartment syndrome (100%, N=87). There were 19 females (21.8%) and 68 males (78.2%). The population included 39 African-Americans (44.8%), six Hispanics (6.9%), two categorized as other (2.3%), and 40 Caucasians (45.9%). Fifty-eight (66.7%) did not survive and 29 (33.3%) others were dispositioned either to home (12 or 13.8%), home health (3 or 3.4%), jail (1 or 1.1%), nursing home (1 or 1.1%), rehab (10 or 11.5%), or were transferred (2 or 2.3%). Blunt trauma accounted for 69 of the cases and penetrating trauma accounted for the remaining 18 cases. Abdominal infection occurred in 45 cases, acute lung injury in two cases, spinal cord injury in 20 cases, and traumatic brain injury in 24 cases. Polytransfusion occurred in 62 cases, abdominal infection in 45 cases, massive fluid resuscitation in 85 cases, sepsis in 45 cases, hypothermia in 11 cases, coagulopathy and acidosis in 29 cases. Mortality was 67.8% in those receiving polytransfusion, 55.6% in those with abdominal infection, 65.9% in those who received massive fluid resuscitation, 64.4% in those who developed sepsis, 81.8% in those with hypothermia, 65% in those with coagulopathy and acidosis. The mean Hematocrit of all subjects was 33; lactic acid level was 6; and APACHE IV score was 73. Of those that did not survive the illness, the mean Hematocrit was 34; lactic acid level was 5; and APACHE IV was 73.

The risk factors for developing ACS as identified by WSACS that are included in this study were massive fluid resuscitation, polytransfusion, abdominal infection, sepsis, hypothermia, coagulopathy, and acidosis. In this population, polytransfusion was not a significant cause of mortality (P=0.2). Abdominal infection and sepsis showed an equally significant relationship to mortality (P=0.03). Hypothermia (P=<0.00000001), coagulopathy (P=0.000006), acidosis (P=0.000003), and massive fluid resuscitation (P=0.000000032) all showed a very significant relationship to mortality. The strongest statistical relationship was between hypothermia (temperature <91° F or 33° C) and mortality. The weakest relationship was between abdominal infection, sepsis, and mortality. As expected, a patient with abdominal infection was likely to develop or already had sepsis (r=0.3). Interestingly, a patient receiving polytransfusions was also likely to develop or already had sepsis (r=0.3). The statistical analysis showed a weak correlation between polytransfusion and massive fluid resuscitation (r=0.24). There were no significant negative correlations in this particular data set. Polytransfusion and hypothermia showed the highest risk for mortality (RR=1.12 and RR=1.95). Coagulopathy, acidosis, abdominal infection, massive fluid resuscitation, and sepsis (RR=0.95; RR=0.95;
RR=0.48; RR=0; RR=0.87, respectively) surprisingly did not show an increased risk for mortality in this population.

Another look at the data in comparison to mortality includes considering whether blunt or penetrating trauma was the mechanism of injury (Table 1) and if comorbidities were associated with mortality (Table 2). In this population, there was a significant relationship between blunt trauma and mortality (P=0.03). However, a much stronger relationship exists between penetrating trauma and mortality (P=0.00000000027). Analysis also showed a very strong relationship between acute lung injury, nonoperative kidney injury, nonoperative liver injury, nonoperative spleen injury, spinal cord injury, traumatic brain injury and mortality (all with P<0.000001). A patient with a history of cardiovascular, cerebrovascular, renal, or pulmonary diseases, or diabetes also had a significant relationship to mortality (all with P<0.0000000001). The relative risk was also examined in trying to establish if a patient with a certain risk factor is at a higher risk for mortality. Spinal cord injury was not associated with an increased risk for dying (RR=0.85). Traumatic brain injury was associated with the risk for dying (RR=1.06). There was no association between having a history of cerebrovascular disease and dying (RR=1). A history of renal disease did not pose an increased risk for dying (RR=0). History of pulmonary disease, diabetes, and cardiovascular disease (RR=0.98; RR=0.35; RR=0.8, respectively) did not show an increased risk for dying. Further statistical analyses revealed that strong correlations existed between nonoperative kidney and liver, spleen and kidney, and spleen and liver patients (r=0.56; r=0.62; r=0.9, respectively). There was also a correlation between patients with a pulmonary disease history and cerebrovascular disease history (r=0.57). Smaller correlations between a history of diabetes and acute lung injury, cardiovascular disease and cerebrovascular disease, cardiovascular disease and diabetes, and pulmonary disease and cardiovascular disease existed (r=0.22; r=0.23; r=0.36; r=0.24, respectively). As well, only a small correlation existed between Hematocrit level and mortality (r=0.25) and APACHE IV score and mortality (r=0.22).

Discussion

Strengths. We found a particularly strong association between hypothermia and mortality (RR=1.95). This clearly indicates nearly a double risk of death for a patient with ACS and having hypothermia occur at the same time. This is a very strong indication that in practice, prevention of hypothermia in the ACS patient population is of paramount importance in preventing death. Polytransfusion, defined as a patient receiving greater than ten units of packed red blood cells within 24 hours, was the second greatest risk for mortality in ACS patients (RR=1.12). The need to transfuse patients in the trauma setting is greatly increased due to multiple traumatic injuries and frequently associated hemorrhage.

This study is unique in that it seeks to draw an inference from the type of risk factor that a trauma patient with ACS may already have and how that increases mortality for that patient. No other studies to date have sought to determine that relationship. Many studies conclude that the development of IAH or ACS significantly increases mortality, but have not sought to determine whether a particular risk factor was indeed present and established a causal relationship with mortality. This study did just that. We were able to determine that hypothermia was the most causative condition for mortality in trauma patients who had developed ACS.

The findings associated with this study are easily generalizable to a trauma population with patients who have already developed known ACS. By evaluating data in this same fashion, a determination of risk factor causal for mortality may be obtained. Due to the lack of a
prospective model in which data are collected in controlled environments (same time, same place, etc.), it may be more difficult to collect data in the exact same fashion. However, using the same methods in a relative manner to evaluate these risk factors is easily reproduced.

Limitations. Very few IAP measurements were repeated on any one patient once the first one had been completed. Other studies tend to measure IAP every six hours, then determine a maximum, minimum, and mean IAP. Even though this may have been beneficial in knowing a more specific range for IAP values in this study, that data was not available at the time of collection. As well, there is a considerable need for the setting in which ACS is probable to develop and adhere to a protocol for assessing for ACS and for monitoring IAP. Even though a standardized procedure existed, no protocol calling for indications and treatment was in place at the time of this study.

Although a comprehensive list of parameters was tracked in this population, it would have been helpful to have evaluated a sepsis-related organ failure assessment (SOFA). However, the data including rates of vasoactive drips was not readily accessible for this study.

Although a strong relationship was established between hypothermia, polytransfusion, and mortality, this study did not seek to rule out further possible causes of mortality in these same trauma patients. Only evidence of a relationship between the chosen risk factors and mortality was sought. In essence, it is possible that a patient could have hypothermia, yet their actual cause of death was hypovolemic shock or brain stem herniation. A sole cause of mortality was not the intent of this study. However, in patient who developed ACS, this study's intent was to identify a causal relationship between risk factors associated with ACS and if they were associated with mortality. Even though hypothermia and polytransfusion showed a significant relationship to mortality and a high risk for mortality, it may not be the one-and-only indication for mortality.

All attempts were made to eliminate bias. However, here may be small tendency for nondifferential misclassification bias as there is with any chart review method for retrospective study. Although all efforts were made to collect data consistently, because records were maintained in different fashions, a computerized charting system had been implemented, and charting requirements had changed, it is likely that this bias could be exhibited within this study.

Interpretation. Interestingly, we thought there would be a stronger relationship between massive fluid resuscitation, ACS, and mortality as there were in other recent articles. This study showed that massive fluid resuscitation was significantly related to mortality, but did not have an increased risk ratio for mortality (RR=0). Perhaps this is because of the small number of patients in this study or because all trauma patients are massively fluid resuscitated and there were no discriminating differences between those subjects who died and those who did not. Although massive fluid resuscitation is a predictor for developing ACS, in this study, it is not associated with an increased risk for dying. As well, with the recent exposure in the literature of hypothermia-induced states, we were surprised to find that hypothermia nearly doubled the risk of mortality in these patients. Data were not re-reviewed to determine if other things might have contributed to the mortality associated with hypothermia. However, it is clear that most trauma patients exhibit a hyperdynamic state during the acute injury phase and that an uncontrolled hypothermic state can actively contribute to death.
Conclusion

This study further clarified what many others have already suggested. ACS carries a significantly higher mortality among ICU patients. This study identified two of the many risk factors as direct attributors to mortality in trauma patients with ACS. Identifying hypothermia and polytransfusion as the leading causes of death in ACS patients, we as practitioners should readily assess and treat these issues. Preventing hypothermia or at least assessing for the presence of hypothermia can act as a warning sign that a particular patient is at risk for developing ACS. Not only is this patient at risk for developing ACS, but they are at almost twice the risk of dying from it due to having exhibited signs of hypothermia. Likewise, because polytransfusion is so common in trauma patients, this makes us even more aware of how deadly ACS can be when it develops in this population. Recent trials have made very clear that physical examination alone is not sensitive enough to determine the present of IAH or ACS. So as we look to become more sensitive in identifying ACS and preventing death associated with it, it is of paramount importance that we can paint a picture of the worst case scenario in an ACS patient. This article clearly shows a distinct relationship between hypothermia, polytransfusion, and increased mortality. If anything at all, these risks should become standard "red flags" in our practice as we deal with patients coping with such a morbid illness.

References


**Table 1: Mechanism of Injury and Mortality**

<table>
<thead>
<tr>
<th>Mechanism of Injury</th>
<th>Significance for Death</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blunt Trauma</td>
<td>P=0.03</td>
</tr>
<tr>
<td>Penetrating Trauma</td>
<td>P=0.000000000027</td>
</tr>
</tbody>
</table>

N=86, CI 95%

**Table 2: Comorbidities, ACS, and Mortality**

<table>
<thead>
<tr>
<th>Comorbidity</th>
<th>Relative Risk</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spinal cord injury</td>
<td>0.85</td>
<td>P&lt;0.000001</td>
</tr>
<tr>
<td>Traumatic brain injury</td>
<td>1.06</td>
<td>P&lt;0.000001</td>
</tr>
<tr>
<td>Cardiovascular disease</td>
<td>0.8</td>
<td>P&lt;0.000000000001</td>
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<td>Cerebrovascular disease</td>
<td>1</td>
<td>P&lt;0.000000000001</td>
</tr>
<tr>
<td>Renal disease</td>
<td>0</td>
<td>P&lt;0.000000000001</td>
</tr>
<tr>
<td>Pulmonary disease</td>
<td>0.98</td>
<td>P&lt;0.000000000001</td>
</tr>
<tr>
<td>Diabetes</td>
<td>0.35</td>
<td>P&lt;0.000000000001</td>
</tr>
</tbody>
</table>

N=86, CI 95%
Contributors

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