The Philadelphia Obstetrics Crisis: Etiology, Implications, and Solutions
For Maintaining Quality Obstetric Care and The Viability of Academic Medicine

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by

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The Philadelphia area has been the site of an unprecedented number of maternity unit closures over the past 15 years. Starting with the closure of the maternity floor at Medical College of Pennsylvania Hospital in 1997 and culminating this summer with the closure of Northeastern Hospital planned for June 2009, a total of 16 providers of obstetrical care will have been eliminated. This has led to nearly a 35 percent decrease in the number of staffed maternity beds in the city. The reasons postulated have been identified as a combination of high malpractice and low reimbursement. Thus far all of the 15 closures have been community hospitals in the area, many of which have provided obstetrical care to the city of Philadelphia for the last 50-100 years. In contrast, the six remaining providers of maternity care in the city of Philadelphia are all academic medical centers. The strengths, weaknesses and missions of community versus academic medical facilities play a significant role in this outcome. The questions to be examined in this paper are what are the reasons for these closures. If it is due to malpractice and reimbursement issues, why have academic medical centers thus far persevered in the face of this environment? What are the implications for both maternity care and medical training at institutions in the city if this situation is not resolved? Lastly is the current situation sustainable and what are some possible solutions to the crisis for the area.
I. Introduction

The maternity care system in the city of Philadelphia is in a state of crisis. Over the past 15 years, 15 maternity units (Table 1) across the city have closed and another, Northeastern Hospital is planning on shutting down its maternity unit as of June 30, 2009. The decline in staffed maternity beds over this period of time has been roughly 35% (Burling, 2007). The proximate cause is the difficulty in financing maternity care. Healthcare as structured in the United States, is a business like any other where ultimately revenues must at least equal liabilities. In providing maternity care in the Philadelphia region this has become a near impossibility and has been quoted by every hospital which has closed its’ maternity unit as the primary reason for that decision.

The ultimate cause of this problem is two fold, poor reimbursement from insurance providers and high malpractice premiums in the Philadelphia area. Unlike most other industries where increased costs of doing business can be passed on to the consumer, healthcare providers often do not have this flexibility. One reason is that the already extremely high cost of health care services is beyond the ability for most persons to pay out of pocket. And following from this the overwhelming portion of financing to the system is provided by entities such as the government (via Medicaid), as well as private insurers whom reimburse at a preset rate for services, regardless of the cost. Medicaid, which pays for an increasing number of deliveries (greater than 75% at some hospitals) only reimburses 77- 82% of costs on average for maternity care (Burling, 2007). Meanwhile the cost of providing this care continues to increase as patients require and/or demand access to increasingly high tech and expensive care and the medical malpractice system drains resources away in numerous large judgments. To obtain malpractice insurance in the Philadelphia area, some physicians or the hospitals that employ them pay more than $150,000 annually per physician (Burling, 2007). The combination has lead to a situation at many institutions where they lose on average $1000-$2000 per patient on maternity care (Burling, 2007). This leaves many hospitals with only two options, to close maternity units, or subsidize maternity care through other operations. Some facilities have attempted the later as they saw it as an obligation to
provide this care for the community they served. Increasingly hospitals are giving up the service completely.

In this environment many of the community hospitals that have always provided the foundation of maternity care for Philadelphia, have closed. Of the six hospitals remaining, all have one thing in common; they are academically affiliated medical centers (Table 2). What is it about this hospital model that has allowed them to survive? The goal of this paper is four-fold: First, to review the etiology of the crisis, non-viable financial models for providing maternity care in Philadelphia. Second, evaluate the reasons why academic hospitals remain as the last resort for maternity care in the Philadelphia region. Third, an evaluation of how this situation has affected access to maternity care for the women and families of Philadelphia, and how could this affect the missions of academic medical centers? Lastly, what are some potential solutions to the problem?
II. The Cost of Maternity Care Operations

Providing care on a modern Labor and Delivery unit is a cost intensive process. The aggregate costs nationwide for the obstetric diagnosis of “Liveborn infant” was over $10 billion in 2006 (Elsevier Medical News, 2008). In addition it is common. In 2002, of the top 10 reasons for hospital admission, “Pregnancy and Childbirth” was second in total number at 4.6 million patients, second only to Diseases of the circulatory system (Agency for Healthcare Research and Quality, 2005).

Based on sheer volume it is understandable that maternity care be responsible for absorbing a large amount of healthcare dollars. But that is not the only reason it is expensive. Modern maternity care is labor and procedurally intensive, requiring a large number of medical professionals of various expertise to be carried out as currently designed.

In looking at Agency for Healthcare Research and Quality data from 2003 in the United States, of the top 10 procedures performed in hospitals four are related to providing obstetric care; number two was medical induction/manually assisted delivery and other procedures to assist delivery at 1,946,000; number four was repair of current obstetric laceration at 1,261,000; number seven was Cesarean section at 1,171,000; and number nine was fetal monitoring at 913,000 (Agency for Healthcare Research and Quality, 2006). In addition the rate of labor induction is roughly 20% nationwide and up to 40% in some community hospitals, and more than 50% receive regional anesthesia in some large labor units (Zhang, Yancey, & Henderson, 2002) (Vincent & Chestnut, 1998). The trend for more procedurally intensive maternity care is expected to continue its rise as pregnant women become older and increasingly obese. Maternity care providers also practice increasingly defensive medicine in order to stave off medical liability lawsuits. This last phenomenon is evidenced by the increasing rate of cesarean section, which has increased 46% between 1997 and 2003 although it has not been shown to improve perinatal outcomes (Agency for Healthcare Research and Quality, 2006).
Staffing and Infrastructure

One of the largest drivers of cost is the personnel required to deliver modern obstetric care. Even within level I perinatal care centers, providing the most basic level of care, it is a requirement that they have a highly trained team of medical professionals available (American Academy of Pediatrics and American College of Obstetricians and Gynecologists, 2007).

This team of direct care providers starts with the registered nurse. The recommended nurse to patient ratio on a maternity unit has a narrow range; from 1:2 for patients who are being followed for an uncomplicated labor to 1:1 for patients with a medical or obstetric complication or undergoing cesarean section (American Academy of Pediatrics and American College of Obstetricians and Gynecologists, 2007). This is in contrast to nurses on medical-surgical floors that might operate with ratios of 1:4 or greater. The dependence on, and need for so many registered nurses dramatically increases the cost of providing maternity care compared to other healthcare settings. Of course this is only the base of the maternity care team. In addition to staff RNs, as the complexity of care provided increases from level two (specialty) care facilities to level three (subspecialty) care facilities the number and expertise of the personnel required can increase substantially (American Academy of Pediatrics and American College of Obstetricians and Gynecologists, 2007). The list includes highly trained and expensive professionals including certified nurse midwives, certified registered nurse anesthetists, family practice physicians, obstetricians, anesthesiologists, maternal-fetal medicine specialists, and neonatologists (Table 3).

Poor Reimbursements

Despite the acute level of care provided and the number and skill of the many healthcare professionals required, maternity care continues to be relatively poorly reimbursed. One of the primary reasons for this is the relatively high number of
maternity patients who have Medicaid as their primary source of insurance coverage. Nationwide of the top 10 most frequent reasons for hospitalization billed to Medicaid, six are related to infancy and childbirth (Agency for Healthcare Research and Quality, 2005). Compared to private insurance, Medicaid reimbursements in the United States are low. In Philadelphia this problem is more acute as Medicaid in Pennsylvania typically pays only 80 cents on the dollar (Bush, 2007). In addition, a significant portion of maternity patients present to the hospital without any health insurance, as evidenced by the fact that “Newborn Infant” is the most common discharge diagnosis for those who are uninsured (Agency for Healthcare Research and Quality, 2005). Both of these issues are significant in a city where the rate of poverty is greater than 25%, thus increasing the number of uninsured and underinsured (Eichel, 2007). When considering private insurers, Philadelphia is notable for having only two significant players, Aetna/U.S. Healthcare and Blue Cross/Blue Shield (Saline, 2002). This relative monopoly has provided them the leverage to negotiate and effectively limit their reimbursements as well, making it more difficult for hospitals to offset the shortfall from Medicaid payments for poor patients.

Conversely, payments made to hospitals for neonatal intensive care typically allows these units to operate at a profit. Although specific data is difficult to obtain related to hospitals in the Philadelphia region, by looking at national data the point can be made. The top two hospital diagnoses with the highest mean charges were for “Infant respiratory distress syndrome” and “Premature birth and low birth weight” at $91,400 and $79,300 per episode (Agency for Healthcare Research and Quality, 2005). Both of these disease entities are treated in the NICU. The obvious point is that maternity patients who deliver critically ill infants fill NICUs, and therefore a connection between the two units is present. The financial reality is that many community hospitals function as level I or level II perinatal care centers, and thus do not benefit, as there is no mechanism to share profits once these patients are transferred to a higher level facility. Indeed, even in some academic medical centers with all services available the maternity and neonatal cost centers are “siloed” so that the obstetrics department may operate at a loss while the NICU/nursery is profitable.
Ultimately this combination of high overhead to operate a safe and modern maternity care floor, low reimbursement from Medicaid, limited income from private insurance providers, and lack of profit sharing model for NICU treatment has lead to an environment in Philadelphia where it is too expensive for most community hospitals to continue to provide maternity services. Although many hospitals feel an obligation to their community to have obstetric services, most of these hospitals are in areas of Philadelphia that are predominantly poor. Thus the small number of privately insured patients who receive care is not enough to allow for sufficient shifting of costs. Therefore these community hospitals have chosen to close maternity services, rather than risk the operations of an entire hospital.
III. The Medical Malpractice Crisis and Maternity Care

While limited reimbursements for maternity care remain a significant issue in the Philadelphia area, it is also true that reimbursement has never been high. In addition Medicaid payments have not historically been competitive with those of private insurers for many decades. Yet as discussed previously many of the facilities that have closed have done so only in the last decade and a half. In fact most of the community hospitals, which closed their maternity services have been in those communities for many decades. Chestnut Hill Hospital, which stopped obstetric services in 2008, had been a maternity care provider for more than 100 years to its surrounding community (Burling, 2008). Clearly it is not reimbursements alone that have lead to recent closures. What has changed is a dramatic rise in rates for medical liability insurance for those who provide maternity care. Dramatic not only in its dimension but also with respect to the rapidity with which these changes have occurred. As noted in a 2003 Joint Economic Committee Congressional report on medical malpractice:

“The past several years have witnessed a considerable increase in the cost and impact of medical malpractice litigation. Between 1994 and 2001, the typical medical malpractice award increased 176 percent to $1 million. The result has been higher malpractice insurance premiums for health care providers, which in turn has led to higher costs for the health care system as well as reduced access to medical services. In 2001, total premiums for medical malpractice insurance topped $21 billion, more than double the amount ten years earlier.”

(Joint Economic Committee United States Congress, 2003)

This report summary has proved prophetic with respect to the Philadelphia region and is at the heart of the maternity closure crisis. This additional expense no longer allows many community hospitals to offset costs of caring for the underserved. It has been common practice that payments of those with private insurance be utilized to subsidize those who are un or underinsured. In this way hospitals have been able to continue to serve the communities where they are based, even as the demographic and
socio-economic make up of those areas have become increasingly poor. However, with such high malpractice premiums it allows only community hospitals in areas with an appropriate payer mix the ability to continue providing maternity services in a financially viable manner. This leaves large communities in Philadelphia with reduced access to maternity care services, mostly in poor areas. In most cases leaving only one of the six academic medical centers to provide maternity care for these women and families.

History and Current Scope of Medical Malpractice in Pennsylvania

The AMA has identified Pennsylvania as one of 18 medical malpractice crisis states (Mello, Studdert, & Brennan, 2003). Crisis as defined “By physicians and institutional health care providers having grave difficulties obtaining affordable professional liability insurance” (Mello, Studdert, & Brennan, 2003). Pennsylvania, while it has only 5% of the nations physicians, accounts for 10% of medical malpractice awards (McCullough, 2006). Combine that with the fact that the chance of being sued for malpractice is nearly twice as high in Philadelphia as it is elsewhere in Pennsylvania, and the scale of the problem is obvious (Rice, 1998). This increasingly litigious environment creates intolerable burdens on physician groups and hospitals providing maternity care as reflected in their medical malpractice insurance premiums. Nationwide the rate of increase for premiums of a practicing obstetrician/gynecologist doubled between the years 2000 and 2002, from 7.0% to 15.3% (Joint Economic Committee United States Congress, 2003). This effect was felt locally when Methodist Hospital in south Philadelphia stopped providing maternity services in 2002 citing as the cause its annual medical malpractice premium increasing 100% from $3 million to $6 million dollars (Gearon, 2002).

This is not the first medical malpractice insurance crisis in Pennsylvania or the United States in general. Both the 1970s and 1980s were marked by nationwide malpractice insurance crises. The crisis in the 1970s was precipitated by the exit of many commercial insurance carriers from the medical liability market due to an increasing
number of medical malpractice lawsuits. This lead to what was known as the “availability” crisis at the time, given the limited number of carriers from which to obtain medical liability insurance. This was alleviated primarily by the creation of physician owned and run insurers, such as the PMSLIC created by the Pennsylvania Medical Society (McCullough, 2006). Legislative action also occurred during this time as the Pennsylvania State Legislature enacted the first law directed at control of medical liability insurance rates. The Health Care Services Malpractice Act of 1975 (Act 111) was passed with the intent of assuring that professional liability insurance was available to health care providers at reasonable costs (McCullough, 2006). The act was to create “Arbitration Panels” to hear all malpractice cases, but this provision was later struck down in the Pennsylvania Supreme Court. A second component was the creation of the Medical Professional Liability Catastrophic Loss Fund (CAT fund). This was developed to provide coverage above and beyond that paid for by the physicians’ primary liability coverage. It also required that providers pay a surcharge to fund future malpractice payouts (McCullough, 2006).

The second crisis in the 1980’s was one of affordability due to a continuing rise in number of claims and subsequent payouts (McCullough, 2006). But in the 1990’s the medical malpractice insurance market became profitable again as premiums rose sharply and investment returns were relatively high (Joint Economic Committee United States Congress, 2003). This period though was short lived and by the end of the decade, again concerns arose. In Pennsylvania four liability insurance carriers went out of business (McCullough, 2006). This marked the onset of the current crisis, which is thought to be multi-factorial. Many point to the tort system, and not the increasing number but increasing size of liability payouts over the decade. The median jury award increased 43 percent between 1999 and 2000, hitting $1 million mark (Gearon, 2002). Lawyers’ groups point back to insurers themselves, whom they say invested their premiums heavily and took profits in the 1990’s, and now that the market is down and they lack liquidity for paying judgments, are passing those costs on to physicians and hospitals.
Regardless of the causes, the crisis continues and is now intensifying. In response the Pennsylvania legislature passed the Medical Care Availability and Reduction of Error Act (MCARE Act) also known as Act 13 in 2002 (Pennsylvania Insurance Department, 2007). The purpose of the legislation was three-fold; to ensure the availability of affordable liability insurance; to provide compensation to patients that have been harmed due to medical error; and as an attempt to reduce medical errors. Following from these objectives the MCARE fund took over from the previously created “CAT fund” in the provision of supplemental malpractice insurance. MCARE requires physicians who have 50% or more of their practice in Pennsylvania to have a primary liability policy that covers $500,000 per occurrence and $1.5 million per annual aggregate (Pennsylvania Insurance Department, 2007). The MCARE fund then provides an additional $500,000 per occurrence and $1.5 million per annual aggregate coverage that exceeds that covered by the primary policy for a total $1 million per occurrence and $3 million per annual aggregate coverage (Pennsylvania Insurance Department, 2007).

Funding for the MCARE fund is provided by assessments levied on physicians. These assessments are based on the physicians “prevailing primary premium” (Pennsylvania Insurance Department, 2007). Because MCARE is a pay as you go system ultimately it charges physicians and hospitals an annual assessment to pay its current claims and operating expenses (Pennsylvania Medical Society, 2009) (Pennsylvania Insurance Department, 2007). These assessments though were so expensive that it made the cost of continuing practice in Pennsylvania prohibitively expensive and many physicians planned to leave the state. In response to this the MCARE abatement program was created in 2003, which provided physicians MCARE assessment discounts if they agreed to remain in active practice in Pennsylvania during the year after receiving the discount. Physicians in specialties with very high liability such as neurosurgery, orthopedic surgery, general surgery, emergency medicine, and obstetrics and gynecology were allowed a 100 percent abatement of their Mcare assessment. All other physicians received a 50 percent abatement (Pennsylvania Medical Society, 2009). This program continued from 2003-2007 but was not renewed by the state legislature in 2008 (Pennsylvania Medical Society, 2009). In addition the program
has an estimated $1.7 billion in unfunded liability with no plan in place on how this will be paid (Pennsylvania Medical Society, 2009). One possibility is that physicians whether they participated in the original program or not will be required to pay. If this occurs in combination with the end of the MCARE abatement program it is difficult to see how those providing maternity services will be able to afford to practice obstetrics in Pennsylvania in general and Philadelphia in particular.

The Effect of Malpractice on Maternity Care in Philadelphia

All community hospitals in the city of Philadelphia have already shuttered maternity units, or plan to in the near future. Malpractice costs have been cited as a primary reason, or at least a factor in all of these closings. While the entire state is “in crisis” regarding liability coverage, the situation in Philadelphia is even more dire. The reason for this is thought to be related to specific aspects of the legal climate in Philadelphia.

The city of Philadelphia, which has only 12.4% of the state’s population, accounts for 50% of "CAT fund" claims (Rice, 1998). In addition physicians are more likely to lose malpractice suits in Philadelphia and when they lose be subjected to higher jury awards (Rice, 1998). The reasons given for this are varied and often controversial; ranging from urban poor looking for a "lottery ticket"; angry minorities looking to get back at society; and the thought that Philadelphia juries are too poorly educated and easily swayed by emotion. Regardless of the reason, it makes practicing in the city of Philadelphia more difficult as liability insurance carriers avoid providing coverage to physicians practicing in the city, or offer coverage at unacceptably high rates.

Despite the crisis, maternity care services in the Philadelphia suburbs, in contrast with the city continue to be viable models. An example, Holy Redeemer Hospital plans on spending $700,000 to expand maternity care services (Burling, 2007). This is
primarily in response to the overflow from the city that many of these facilities such as Holy Redeemer, Abington, and Lower Bucks County hospitals are expected to absorb. But it is only because these facilities have enough privately insured patients that they continue to provide maternity care at all.

Ultimately, only the six academic medical centers (AMC) remain to provide maternity care in the city of Philadelphia. While community hospitals that have obstetrical services exist in the suburbs, to have the option of a community hospital experience means that you must travel to access those facilities. In addition it assumes that these hospitals will continue to accept Medicaid reimbursement for delivery of maternity care to less affluent customers. While EMTLA (Emergency Medical Treatment and Active Labor Act) statues mandate that these women receive care if they arrive in active labor or with some other complication of pregnancy, it does not require that these women receive prenatal care services at these same facilities. This could lead to the creation of a two-tiered system for delivery of obstetric care services in the Philadelphia area. One for women who either live in the suburbs or have sufficient means of transport to receive care at these facilities; and a second tier for women who rely on public transport (i.e. Mass transit and/or EMS ambulance services) for accessing maternity care providers. It is unclear if this is necessarily a “good” or “bad” outcome. As discussed previously this default means that these women are required to access care at academic medical centers. A potential benefit of this is that they have access to the highest level of care, which many of these women often require given the social and demographic circumstances that tend to make their pregnancies “high risk”. A potential downside is having no choice other than to receive care at “teaching hospitals” delivered by resident physicians. The term “teaching” only identifies the more positive side of the relationship, because these facilities are also simultaneously “learning hospitals”. Learning at the hands of resident physicians of various experience levels and being the subject of research trials which occur more frequently at academic medical centers. Some feel therefore that they are “guinea pigs” for the training of medical students and residents, and the problematic historical implications of poor minority groups becoming a focus of medical research cannot be understated.
The other side of the equation are the implications for AMCs that have to contend with being the maternity provider of last resort for a group of patients that are more medically and socially complex, highly litigious, and simultaneously provide the lowest reimbursements. As this is a new phenomenon it is not completely clear what the outcome will be, but some evidence suggests that academic medicine in the city may as well be negatively affected if this situation continues unabated. But for now they remain, providing a service that no Philadelphia community hospital felt it could afford to provide. Why is this the case?
IV. The Strengths of Academic Medicine

One of the primary reasons why academic hospitals continue to provide maternity care is that their missions are to train medical students, resident physicians, and to perform research.

As defined by the American Hospital Association:

“(Academic or) teaching hospitals educate and train future medical professionals, conduct state of the art research, care for the nation's poor and uninsured people, and stand ready to provide highly specialized clinical care to the most severely ill and injured.”

(American Hospital Association, 2006)

This combined mission is one of the strengths of these institutions; both with respect to the provision of care, as well as with regard to financing it. The missions noted in the above statement result in alternative or enhanced revenue streams for academic medicine departments and medical schools that are not typically available to the majority of smaller community hospitals. The most significant of which is the training of future medical professionals. This includes the instruction of medical students to become physicians and the training of residents (newly graduated medical students) in one of 27 recognized medical specialties.

Medical schools

Currently there are 149 public and private accredited medical schools in the United States, and while all function as non-profit institutions, they bring in significant revenue. The modern medical school is a complex organization that brings in revenue from multiple sources. In a financial survey administered by the AAMC (Association of American Medical Colleges), total revenue for the 2003 fiscal year for 125 of the
allopathic medical schools equaled $56.9 billion, an increase of 8% from the prior fiscal year (AAMC, 2009). While practice plans and clinical activities make up a large portion if this income, roughly 65% comes from other sources including; federal, state and local government appropriations, tuition, endowments/gifts, and grants/contracts (AAMC, 2009). An example is the endowment for the University of Pennsylvania, which manages a medical school and two obstetric and gynecology residency programs in the Philadelphia area. Its total assets grew to $6.6 billion dollars in 2007, providing nearly a half-billion dollars of funding for university programs (University of Pennsylvania, 2009). In addition medical school tuition as a source of funding is relatively small but it is also elastic. In the early part of this decade medical schools in large systems such as the University of California and the State University of New York increased tuition from 5-30% depending on student residency (Croasdale, 2003). Currently tuition for Drexel University College of Medicine (DUCOM), a private university, is estimated at $42,430 for the 2008-2009 academic year (Drexel University College of Medicine, 2009). Roughly 85% of students receive financial aid, much of which is supported by federal funds (Drexel University College of Medicine, 2009). In effect, this represents an additional source of federal dollars brought into these institutions. In fact in the DUCOM Dean’s Annual Report, it is stated that for fiscal year 2007-08 the college generated an unrestricted profit of $1.8 million as a result of several factors, one of which included increased medical student class size (Drexel University College of Medicine, 2008).

The Liaison Committee on Medical Education (LCME) is the nationally recognized accrediting authority for medical education programs leading to the M.D. degree in the United States and Canada. The Association of American Medical Colleges and the American Medical Association sponsor the LCME. Because of their role in accreditation, the LCME in many ways mandates the structure of academic medical centers via its guidelines for the structure of medical schools.
Some of the most pertinent mandates include:

*That curriculum should include clinical experiences in family medicine, internal medicine, obstetrics and gynecology, pediatrics, psychiatry, and surgery.*

*Medical students should learn in clinical environments where graduate and continuing medical education programs are present in order to link medical student education to the later stages of the medical education continuum.*

*All medical school faculty members should work closely together in teaching, research, and health care delivery.*

*Medical schools should make available sufficient opportunities for medical students to participate in research and other scholarly activities of the faculty.*

*The graduate and continuing medical education programs at training sites where medical students are located should be accredited by the appropriate accrediting bodies.*

From “*Functions and Structure of a Medical School*”
(Liaison Committee on Medical Education, 2008)

**Graduate Medical Education**

While an accredited medical school is the base of an academic medical center, resident physicians are fundamental to the functioning of academic medical centers. Residency positions are filled after graduation from medical school. New physicians are assigned to one of the many thousand residency positions throughout the country via “the match”, a computer algorithm-matching program, which “matches” the new resident to an open position.
Residency positions are available in one of 27 ACGME (Accreditation Council for Graduate Medical Education) approved medical specialties such as internal medicine, family medicine, pediatrics, radiology, anesthesiology, surgery, and obstetrics and gynecology. This year the national resident matching program reported having 22,427 positions available (National Resident Matching Program, 2009).

The presence of resident physicians allows attending faculty physicians to evaluate, treat, and perform procedures on many more patients than would be possible without their help. In many ways they supplant the role occupied by so called “physician extenders” such as nurse practitioners and physician assistants, utilized more heavily in community hospitals. In this way they provide a financial benefit to an academic hospital and allow them to treat more patients. It is also true that as these are physicians in training and many times they perform tasks more slowly, and utilize more resources compared to more experienced providers. Therefore in this respect many consider the resident practice factor cost neutral at best. It is the government financing of resident education that enhances hospital revenue for academic medical centers.

The federal government via the Centers for Medicare and Medicaid services (CMS) helps pay for graduate medical education by providing direct and indirect payments to hospitals through Medicare, and currently spends approximately $8 billion dollars per year doing so (Croasdale, 2004). This therefore provides another stream of revenue to hospitals in academia; nearly $80,000 per resident, and combined with the work they help to provide make residency positions a valuable commodity (Croasdale, 2004). Proof of this is revealed in the number of requests for residency slots from hospitals to the CMS. In the 1997 Balanced Budget Act the number of residency positions was capped at roughly 98,000 by the federal government (Croasdale 2005). This did not prohibit any hospital from having more residents than they were slotted for, but CMS would not provide more funds beyond the previously allocated amount. Since this time the amount of residency positions has held at the 98,000 mark (Croasdale, 2005). But in 2003 the Medicare Prescription Drug Improvement and Modernization Act mandated that unused residency slots be reallocated (Croasdale, 2005). Since this time
more than 530 hospitals have requested over 4,600 residency positions (Croasdale, 2005).

This is not to say that the demand for residency positions is motivated strictly by revenue. Many facilities have underserved communities with unmet medical care requirements that resident staff help in fulfilling. In addition, strict oversight is provided by the ACGME, which ensures that residents are not utilized strictly to perform work but that adequate educational activities are present and that work hour rules are maintained. Any program not accredited by the ACGME cannot receive funds from CMS for its residency slots (Accreditation Council for Graduate Medical Education, 2009).

Similarly to the LCME, the ACGME has requirements that also solidify and mandate academic relationships with respect to the training of resident physicians:

* A residency program must be a structured educational experience, planned in continuity with undergraduate and continuing medical education and while such residency programs contain a patient-service component, they must be designed to provide education as a first priority and not function primarily to provide hospital service.

* The program must exist in an educational environment that should include at least two other relevant graduate medical education programs such as internal medicine, pediatrics, surgery, or family medicine.

* (The program director) must ensure that formal teaching activities be structured and regularly scheduled, (and that Faculty) devote sufficient time to the educational program to fulfill their supervisory and teaching responsibilities; and to demonstrate a strong interest in the education of residents

* Some members of the faculty should also demonstrate scholarship by one or more of the following: peer-reviewed funded research; publication of original research
or review articles in peer-reviewed journals, or chapters in textbooks; publication or presentation of case reports or clinical series at local, regional, or national professional and scientific society meetings; or participation in national committees or educational organizations.

From “ACGME Program Requirements for Graduate Medical Education in Obstetrics and Gynecology”
(Accreditation Council for Graduate Medical Education, 2008)

Biomedical Research at Academic Medical Centers

In addition to the educating future health care providers, performing biomedical research is a major focus of many academic health centers. The federal government via the National Institutes of Health (NIH) is a leader in providing funding for medical research centers throughout the United States. The FY 2009 budget request for the NIH was $29.5 billion (National Institutes of Health, 2008). While not all of these funds go to academic medical centers a significant portion of research dollars are allocated to these institutions. In reviewing data from the NIH Report Portfolio Online Reporting Tool website, which provides data on total grants provided to a given institution, it is clear that significant resources are directed toward local academic medical universities (Table 4) (National Institutes of Health, 2009).

While a significant portion of these monies go toward funding research infrastructure, staff, supplies, and researcher salaries it is at times unclear what proportion. In a study to evaluate the amount of NIH support received for clinical investigation at Massachusetts General Hospital, Taylor et. Al. commented that:
“Academic health centers (AHCs) have traditionally been unable to determine the proportions of their research budgets devoted to clinical research” and that “These activities not only represent an important source of revenues for AHCs, they are also unique to academic institutions and represent an important synergy of their missions of research and patient care.” 
(Taylor, Stubbs, Singer, Curhan, & Crowley, 2002).

In addition to government-funded research, academic medical centers perform industry-funded research. Some estimates are as high as $50 billion with regard to the amounts spent (Moses & Martin, 2001). This research is funded for the development of new drugs, medical devices, and diagnostic tests (Moses, Braunwald, Martin, & Thier, 2002). While there are some ethical issues currently being discussed in academic circles regarding the appropriate way to collaborate between academic medicine and industry, it is clear that the additional revenue is beneficial. These monies also are not typically available to many smaller community hospitals.

The Structure and Function of Community Hospitals

In contrast to AMCs, the majority of non-teaching institutions have dramatically different goals and structures. Some community hospitals have residency programs and some have medical students that rotate on a short-term basis. But primarily they are staffed to provide efficient patient care, not education. There is an increased utilization of physician extenders as opposed to resident staff, and for many the primary source of revenue is from clinical volume and procedures.

While some of these facilities may even provide care that is considered “cutting edge” most often these treatments have been researched and standardized at tertiary (academic) hospitals. When community hospitals decide to deliver such treatments they are provided to obtain a competitive advantage over other community hospitals in the area to increase patient volume and often maximize reimbursement. An example of this is
Cardiac care involves many procedures such as cardiac catheterization and cardiac care unit admission which are reimbursed at a much higher rate relative to the malpractice and other infrastructure required to perform them. Maternity care in contrast provides low reimbursement and high malpractice/overhead. Without any mandate to force the provision of these services and many times lacking additional resources to subsidize it, maternity care is often seen as an unacceptable liability in a community hospital setting.

**Academic Symbiosis and Philadelphia Maternity Care**

Given regulations of the LCME and ACGME the interaction between medical students, residents, academic physician faculty, medical schools and hospitals is complex and highly regulated, but it is also a source of strength. Academic medical centers, in order to have an accredited medical school, are mandated per LMCE regulations to provide as part of the curriculum during the third and four year of training, a clerkship in obstetrics and gynecology. Therefore, as a requirement to maintain medical school accreditation, these centers must keep their labor and delivery units open to ensure appropriate educational opportunities for their students. In addition, the presence of medical students requires resident physicians, and vice versa. Both require supervision and instruction by attending physicians who are engaged in academic activities such as research.

Academic attending physicians, given their other responsibilities likely could not service the volume of patients they do without the assistance of medical students and residents. These symbiotic educational connections have allowed the six facilities; Hospital of the University of Pennsylvania, Pennsylvania Hospital, Temple University Hospital, Hahnemann/Drexel University Hospital, Thomas Jefferson University Hospital, and Albert Einstein University Hospital to become the remaining providers of maternity care in Philadelphia. Therefore the burden falls on AMCs in the Philadelphia area to continue to provide obstetric care. Not only are they mandated to do so as a function of
their educational missions; but also it is the synergy of those missions that provide the necessary resources, human and financial.
V. The Paradox of the Academic Physician and Philadelphia Maternity Care

The educational and research components of academic medical centers have allowed them to continue to provide a service (maternity care) that many community hospitals have been forced to abandon. The ultimate cause is that the reimbursement and medical liability environment in the Philadelphia region do not provide a viable financial model. While academic obstetric departments have been able to survive, they are not necessarily thriving from a financial standpoint. These same pressures have impacted their profitability as well. In fact AMCs have become increasingly reliant on practice revenues for operations. Academic departments therefore are under increased stress, as they must simultaneously attempt to improve their financial circumstances while fulfilling their academic mission.

In a Milbank Memorial Fund paper titled “The Future of Academic Medicine”; they defined academic medicine as, “The capacity of the system for health and health care to think, study, research, discover, evaluate, innovate, teach, learn, and improve” (Milbank Memorial Fund, 2005). This sentence succinctly summarizes the goals of an academic medical center as well as the functional unit of the AMC, the academic physician. Academic physicians combine the roles of a clinical physician, scientist, and teacher. They function as the liaison between laboratory biomedical advances and clinical practice. In addition, they pass that knowledge on to future health care providers.
Flexner- From Three Legged Stool to Big Wheel?

The foundation of academic medicine has always been, research, education, and clinical practice; the so-called “three legged stool”. The history of academic medicine is founded on this structure following from the findings and recommendations in the Flexner Report of 1910 (Thier, 1992). Prior to the establishment of these principles medical training was randomly organized, and primarily based on apprenticeship and proprietary medical schools. This led to a wide variation in medical philosophies and skills among practitioners. The Flexner Report led to the standardization of medical training based on three principles:

1. Medical science departments must conduct research of quality...and science must be taught as the foundation of clinical practice.
2. Teaching (should) emphasize concepts (of medicine) versus rote memorization
3. A structured, supervised, patient based clinical education should be provided (Thier, 1992)

In his report Flexner stated the goal of this approach; “If the sick are to reap the full benefit of recent progress in medicine, a more uniformly arduous and expensive medical education is demanded” (Beck, 2004).

Flexner understood that the “expense” of medical education would make it a non-profitable venture, but felt that it should be undertaken because it was for the good of the nation. As academic medicine expanded, and it do so rapidly after the end of World War II, its’ growth was fueled by government funds for biomedical research via the NIH as well as through private philanthropy via endowments. Faculty compensation was subsidized to allow time for research and educational pursuits. But that paradigm is changing. As medicine in general became increasingly pressured financially due to larger macroeconomic forces, such as a decreased government spending and the rise of HMOs, medical schools became more reliant on revenue from practice income. This subsequently has placed academic physicians under increasing pressure to produce
clinically in order generate sufficient revenue to support their salaries. Many AMCs have moved toward using relative value units (RVUs), to monitor the clinical productivity of faculty. The RVU was developed in 1992 by HCFA (the Health Care Financing Association and precursor to CMS) in association with the Harvard School of Public Health (Johnson & Newton, 2002). The purpose of RVUs was to establish a standard mechanism to determine Medicare payments for various physician services, but increasingly it functions as a way to measure physician productivity in academic as well as private medical practices. The difficulty in academic medicine is how to quantify the value of non-clinical activities for faculty compensation plans. As RVUs only calculate clinically productive activities such as, seeing patients in the office and performing surgical procedures, they do not place a value on teaching activities or research. Many academic medical centers are attempting to devise mechanisms to correct for this, but it has proven difficult. Consequently the concern is that the lack of measures for assessing the contribution of teaching, as well as the fact that academic physicians earn less than those in private practice, will lead to fewer physicians with the desire to teach (Milbank Memorial Fund, 2005).

A further obstacle for the academic obstetrician/gynecologist is the relative paucity of government funding for research in women’s health. While roughly 75% of funds for sponsored research originated from the NIH, the percentage of that funding directed toward obstetrics and gynecology was only 1.1%; this is compared to 21.9% for research in internal medicine (Longo & Jaffe, 2008). The lack of government research support forces those who are interested in research to perform unfunded research or obtain funding from industry sources. Both can pose a dilemma for academic physicians who want to engage in research. Unfunded research is more time consuming due to the lack of personnel support. This combined with the need to be clinical productive make it almost impossible to develop ideas, write grant proposals, and instruct medical students and residents in research techniques. Using industry funds at times can be ethically challenging. In addition, research that may be clinically relevant but not profitable may be hard to get funded.
It has been remarked that modern academic medicine more resembles a “big wheel” as compared to the three-legged stool. Where clinical medicine is the driver (the large front wheel and pedal), while education and research are the two smaller wheels in the back that are pulled along. The tension between these competing missions continues to escalate as academic physicians are expected to be more clinically productive; but in addition continue to educate medical students, train residents, perform research and publish. This creates a paradox for academic medical centers and faculty in the Philadelphia area. Because ultimately while it is the educational and research missions that have allowed AMCs to continue and provide maternity care; the pressure to increase clinical productivity, to offset the poor economics of practicing obstetrics in Philadelphia make it increasingly difficult to adequately fulfill these academic missions. As Flexner stated medical education is “expensive”. Therefore we cannot expect academic physicians to overcome a non-viable cost structure while, providing excellent patient care, teaching, and performing cutting edge research. The combination of these obligations threatens to negatively impact all of the missions.
VI. Interventions to Resolve the Crisis

As the ultimate cause of the crisis that is occurring in the Philadelphia area fundamentally is related to the two issues of poor reimbursement and the high cost of medical liability; the simple answer would be to increase reimbursements and provide meaningful reform of medical liability laws in the state. Unfortunately both of these changes would be, or have proven to be politically difficult.

Any future significant increase in Medicaid payments is unlikely, and because Medicaid pays for a majority of maternity care in the city of Philadelphia, any significant increase in maternity care reimbursement for providers must come via Medicaid. But given significant government deficits on the state and federal level, as well as the increasing number of under and uninsured, any increase significant enough to make maternity care profitable or at least cost neutral is not soon forthcoming.

The situation for reform of medical malpractice is similarly stagnant. While tort reform laws have been proven to reduce medical liability premiums such as in California, with MICRA (The Medical Injury Compensation Reform Act) passed in 1975, limited change has occurred thus far in Pennsylvania. MICRA included several provisions, most significantly were those limiting non-economic damages to $250,000 and binding arbitration on disputes (Joint Economic Committee United States Congress, 2003). Since this time from 1976-2000 liability insurance premiums have increased 167% in California, compared to 505% in the rest of the nation (Joint Economic Committee United States Congress, 2003). In Pennsylvania such reforms, while fought for by physicians for many years, have been not been enacted, likely due to significant influence in the state from the trial lawyer lobby. The most common reason given for opposition to tort reforms is that it will limit the ability of families to seek remuneration to help care for infants injured due to medical negligence. A common sense solution is a bill that has been submitted to the New York State legislature entitled the “Neurologically Impaired Program for New York State”. This system moves these cases out of the tort system, and creates a fund for any brain-injured child once it is determined they meet criteria for
need. This system would provide payment to all families in need, speed payment by avoiding trial, provide practitioner education if negligence was the reason for the injury, and decrease costs for providers by eliminating legal fees (Berkowitz, Hankins, Waldman, Montalto, & Moore, 2009). No such legislation is on the horizon in Pennsylvania. Similarly efforts at national reforms have failed on numerous occasions.

Any solutions for the near term cannot rely on increased payments or reform of liability laws, nor are they likely to be the result of action on a state or federal level. But the non-viable financial model of obstetrics in the city that lead to the closure of all community hospital maternity units in the city persists. Academic medical centers are providing the “safety net” for obstetric care out of obligation to their academic missions and because they have additional human and financial resources to draw upon, but their resources are being strained as well. In addition, this safety net role is likely to negatively impact on their mission of research and teaching of new physicians. Therefore policy changes, even if somewhat incremental, must occur. They must be local and innovative in order to provide the changes necessary to solve the current crisis.

In order to deal with the current crisis, solutions to three interrelated issues must be addressed:

1. **Make providing maternity care at least “cost neutral”**; the combination of high overhead costs, low reimbursement, and high malpractice insurance have led to a situation where providers of maternity care in Philadelphia on average lose money with each delivery. This situation will only worsen as more low-income women receive care at the remaining facilities. In order to prevent a complete collapse, interventions must be devised to make providing maternity care “cost neutral” or even marginally profitable.

2. **Access to quality maternity care must be assured**; with a decreasing number of facilities providing obstetric care we need to ensure that all women and families can still access care easily. This includes not only delivery services but also
continuity of prenatal care. Secondly, some mechanism must be in place to assure that although the number of providers has decreased or changed, that quality of care is maintained throughout the city/system.

3. *The burden on individual academic medical centers must be alleviated*; the financial stains on these institutions and on academic faculty, specifically those providing obstetric care, may eventually result in the degradation of the primary mission of these entities. Some AMCs are stronger financially and some components of the system i.e. NICU care are more profitable. But an environment where all remaining academic obstetric departments can thrive financially and therefore academically must be developed.
**VII. Policy Implications**

**Alleviate Burden on Individual Academic Medical Centers**

In order to alleviate the burden on the remaining academic medical centers so that they can sustainably provide maternity care in the city of Philadelphia action must be taken. *Environmental turbulence* as described in *Health Care Management* by Shortell and Kaluzny is:

> “A rapidly changing environment where; organizations are highly interconnected with one another, and where organizations are highly interdependent with the society in which the organizations find themselves”


This is the environment that the six AMCs find themselves in at this time. One of the responses to such an environment is to form alliances. While it is true that a competitive spirit exists between all of the AMCs for resources and prestige the current crisis must take precedence so strategic alliances can be formed. Strategic alliances, are interorganizational relations entered that enhance an organizations’ mission and performance (Zajac, D'Aunno, & Burns, 2006). It is clear that two parts of the AMC mission, providing care to the underserved and scholarship, are indeed under threat. Alliance formation may stave off this threat. This is important because while not likely, it is possible that the loss of one of the remaining academic obstetric departments could occur. If this were to happen it is unclear what the resultant effect of delivery of maternity care to city residents would be. What is also unclear is what might happen to the other AMCs in such an environment. This level of uncertainty would at the very least make it difficult to make plans for how to allocate resources and develop necessary infrastructure, and at worst lead to total system collapse. The formation of a Philadelphia maternity care alliance at least initially should begin with Albert Einstein, Drexel,
Jefferson, University of Pennsylvania (which includes Pennsylvania hospital and Hospital of the University of Pennsylvania), and Temple.

Such an alliance would be difficult and involve risk, but this could be outweighed by the resultant benefits to all parties involved. Alliances can help with pooling and trading of resources, cost reduction, improved quality and innovation, and to help share risks (Zajac, D'Aunno, & Burns, 2006). For example, all of the AMCs have slightly different and complementary strengths. University of Pennsylvania has enormous size and financial resources. Drexel University while smaller has a strong focus on technology and computer sciences. The combination of these two could possibly result in the development of a citywide electronic medical record for maternity patients. Another potential benefit would be sharing of particularly expensive faculty with required expertise. Maternal Fetal Medicine subspecialists are required to provide consultation on pregnant women with complex medical or obstetrical problems. They are also required in order to function as a level three perinatal center (American Academy of Pediatrics and American College of Obstetricians and Gynecologists, 2007). Therefore all AMC obstetric departments need access to at least one, and preferably more than one MFM subspecialist. What becomes problematic is that these physicians command salaries exceeding $300,000. While this may seem excessive, market forces around the country require such compensation in order to recruit these physicians to the area. Combined with benefits packages and malpractice coverage the cost of MFM faculty can reach the half million-dollar mark. This makes them a significant investment. The ability to share the use and cost of such faculty could result in savings for all AMCs by pooling their resources.

This model is not without precedent. In Nashville, Tennessee two academic medical centers Vanderbilt University Medical Center and Meharry Medical College have been in a strategic alliance since 1999 with good success (Chatman, Buford, & Plant, 2003). Initially created due to changes in the health care environment in the region and financial pressures, the alliance has been sustained and beneficial to both institutions. This is despite significant differences in the sizes and history of the two centers. It could
serve as a model for what can be achieved in the Philadelphia area. Many synergies could be developed that would allow sustainable maternity care for the population to be provided by AMCs in the region, possibly benefiting all stakeholders.

Lastly, cost and profit sharing within each AMC would help alleviate the financial pressures on individual academic OB/GYN departments. Typically hospitals and medical schools (academic departments) function as separate cost centers. This is further subdivided as obstetric and pediatric academic departments as well as hospital maternity and pediatric units are also distinct cost centers. But while this separation is logical for accounting purposes, it does not reflect the complex interaction that takes place between these entities. This is especially true for level III perinatal care centers. In academic medical centers where the sickest and most high-risk mothers deliver infants that require significant NICU care, perinatal care centers should be looked at holistically. This has already been done with respect to providing medical care but it should also be the case regarding their finances. This would require significant alliance building between hospitals and their academic affiliates, as well as among pediatric and obstetrical services. This new financial model would take into account not only the assets and liabilities of each separate unit, but the synergies between the whole. It would also be difficult to achieve and in some cases maybe impossible, especially where completely different entities own hospitals and medical schools.

Despite the difficulties involved in creating such an alliance something must be done to remedy the fundamental disconnect that exists currently between financing of maternity care and pediatric care, specifically regarding NICU hospitalization. On average hospital NICUs are profitable, while on average medical school OB/GYN departments and many hospital maternity floors struggle to remain cost neutral. But without maternity care there is no NICU care. Given those facts it seems reasonable that some percentage of profits should be directed back toward obstetric departments to ensure their survival, and to reduce the pressure on academic physicians in these departments to simultaneously teach, research and be more clinically productive than
their counterparts in other specialties simply because of the financial pressures specific to maternity care.

Assure Access to Quality Maternity Care Services

It is unclear what effect closures that have already occurred or will occur will have on the access to maternity care and the quality of care received within the city. In particular for the women and families that do not have the option to receive care at community hospitals outside of the city due to lack of resources, such as transportation and private health insurance.

Therefore to assess what if any response is necessary to assure access to high quality maternity care, further information on the current state of services must be obtained. This research should to assess two factors; first what effect, if any has the current extent of the crisis had on the quality of obstetric care in the city, and secondly what effect it has had on access to maternity care. Two research tools should be utilized and developed to obtain this data, a citywide obstetric care and outcomes database and Geographic Information Systems mapping and modeling.

Philadelphia Obstetric Database

It is possible that the maternity closures that have already occurred will move beyond a crisis, to a complete collapse of the system. What is difficult to assess is what constitutes a “collapse” and how would we even know if it were occurring? One definition of a collapse could be a poor maternal or fetal outcome that could be directly attributed to the limited availability of maternity care providers. It is not possible to prospectively pinpoint to when this would happen. Only by retrospective and ongoing evaluation could its presence possibly be acknowledged. The goal of a computerized obstetric database would be to provide information about current obstetric practice and outcomes in the city of Philadelphia. This would provide the epidemiological foundation
to assess if the quality of care is deteriorating due to the current crisis. While it is true that the city and state monitor vital statistics such as number live births, abortions, neonatal mortality, preterm deliveries, and teenage pregnancies, this data is limited in its ability to assess the possibly subtle but significant impact of changes in the delivery of care because it only looks at these few macro-indicators. Similarly, individual AMC obstetric departments have quality assurance and improvement conferences (commonly known as morbidity and mortality conferences), but these are limited to events and outcomes only at these institutions. Therefore this information is proprietary and limited in scope. Thus it is not possible to use this information to evaluate patterns occurring on a regional or citywide basis.

Micro level data that encompasses all of the maternity care providers could be an important tool in assessing quality of care and adherence to evidence based practice guidelines. Data points could include information such as which institution provided care, demographic profile of patients, wait times for prenatal visits, number of available maternity beds, antenatal, intrapartum, and postpartum complications, rates of labor inductions, cesarean sections, and NICU admissions. By systematically and broadly recording information on maternal and fetal outcomes throughout the city it may possible to measure the impact of hospital closures that have already occurred and assure the maintenance of quality maternity care.

**GIS Modeling of Philadelphia Maternity Care**

“GIS, Geographic Information Systems also known as Geographic Information Science; combines geography, cartography, and computer science in the creation of a computerized database management system for capture, storage, retrieval, analysis, and display of spatial data. Data can include information about a location such as a street address, zip code, or census tract. Many different types of data can be integrated into GIS and represented as a map layer and when multiple map layers are drawn on top of each other, spatial patterns and relationships can emerge.”
Originally GIS was developed to evaluate relationships in the natural world but recently it has been used in the social sciences including public health to understand the relationships between the geographic environment and health (World Health Organization, 2009). The combination of GIS and public health is not new and can be dated back to John Snow, the British physician and innovator in the field of epidemiology. His study of the London Cholera outbreak of 1854 utilized mapping of disease outbreaks in relation to one of the main water pumps in the city. Similarly GIS modeling could be used to assess and improve access to maternity care in the city of Philadelphia.

Currently, while it is understood that women typically obtain maternity care, (including prenatal care and delivery services) close to where they live, the closure of many community hospitals has likely altered patterns of care that have existed for decades. This is especially true for women who do not have access to a car, making transportation an issue. It is clear that transportation, which has been identified as a *social determinant of health* by the World Health Organization, affects health care outcomes in communities (World Health Organization, 2003). Therefore it is likely that women who depend on public transportation such as mass transit and EMS services to attend prenatal visits and arrive at labor and delivery for evaluation have been, or will be, disproportionately affected by recent closures.

In order to evaluate what has occurred and to plan for the future it is important to first objectively assess the location of maternity patients, providers of prenatal care, and providers of delivery services; and then to assess the interactions between them. Evaluation of where poor and low income women are currently getting there prenatal care, such as the city district health centers, federal health centers, and clinics affiliated with the academic medical centers located throughout the city provide a starting point. Secondly the relative proportions of where low- income women are delivering their
babies with respect to the six remaining maternity care hospitals should be assessed. This could be determined by using zip code data for women who deliver or are triaged, tied to each facility.

This information ultimately could be used to assess if the number of women delivering at any of the remaining hospitals could potentially overwhelm that facilities infrastructure given their known capacity. Subsequently that knowledge could be used to redirect EMS from the standard practice of transporting maternity patients to the “closest” hospital, and instead bring them to a hospital with the most available capacity. In addition this information would be helpful in directing funds to facilities that deal with a disproportionate number of low-income women. It could also be used to set up referral systems among prenatal care providers to equilibrate the number of visits among sites and if necessary set up transportation services between them. Lastly, areas of the city where maternal and neonatal outcomes are poor with respect to the other areas of the city could be identified and interventions planned, again so that resources can be targeted appropriately.

Philadephia Obstetric Electronic Medical Record

The third component in assuring access to quality maternal care is a shared obstetric electronic medical record. This ties together the obstetric database and GIS information and provides maternity care providers throughout the city one record to refer to for care of patients. It would have to be utilized not only among the six academic providers but the other city health care facilities that provide prenatal care. This system would improve continuity, decrease the cost of repeated tests, and provide flexibility so that if a woman had to be transported by EMS to a site where she was not receiving care due to overcrowding her records would be available.
Make providing maternity care at least “cost neutral”

The most difficult problem to address is changing the economics of providing obstetric care in Philadelphia. This is because the pre-existing maternity care infrastructure is expensive, and reimbursements for these services will remain fixed. In addition, any effort to change the legal climate will require some form of legislation as well as a change in the requirement to use the tort system to attain compensation for medical injuries. Most of these policy recommendations therefore will be more difficult to implement and of a long-term nature.

**Disruptive Innovation and Maternity Care- The Birth Center Model**

Disruptive innovation is when cheaper, simpler, more convenient products or services move into the marketplace by meeting the needs of less-demanding customers (Christensen, Bohmer, & Kenagy, 2000). In business this has long been the model for how innovation occurs, such as the move away from complex mainframe computers to home PCs that are cheaper and user friendly. Nationwide, but specifically in Philadelphia, we need to adopt a similar model for maternity care in order to decrease costs as well as provide all women with more than one option for maternity care. One of these options is delivery in a birth center by certified nurse midwives for women who have low risk pregnancies. It is the women with a low risk pregnancy that would be the equivalent of a “less demanding customer” allowing our innovation to take place.

Although data is not available with respect to the Philadelphia area specifically, we can extrapolate national data to make the point. In the United States greater than 99% of deliveries occur in hospitals, compared to other countries such as the Netherlands where 66% of deliveries occur in hospitals (CDC, 2006) (Poorter, 2005). Nurse midwives care for many during their labor with physician back up if necessary. While it is clear that not all patients are identical with regards to their needs or desires for maternity care, in American obstetrics we have settled on a “one size fits all” model of hospital-based labor. The current maternity crisis should make us reassess this paradigm especially given the
fact that the only providers of maternity care are academic medical centers. A quote from an article in the Harvard Business Review from September 2000 applies to the state of obstetrics in Philadelphia:

“General hospitals-especially teaching hospitals-have likewise overshot the needs of most patients. Their impressive technological ability to deliver care enables them to address the needs of a relatively small population of very sick patients. But in the process of adding and incurring the costs of such capabilities, they have come to overserve the needs of the much larger population of patients with less serious disorders.”

(Christensen, Bohmer, & Kenagy, 2000)

Some studies have shown that for many women birth centers can provide equivalent patient outcomes at decreased cost. In a study by Stone and Walker evaluating cost effectiveness, using diagnosis-related group reimbursement charges, costs for care were $1,076 per women in a birth center compared to $2,228 per women with a hospital delivery (Henderson & Petrou, 2008). In looking at a local birth center in Bryn Mawr, in comparison to a routine vaginal delivery in a hospital, it is clear what some of the reasons for this are. First, birth attendants are limited to a certified nurse midwife and registered nurse only, unless the patient is transferred to hospital, which only occurs in 10% of labors (The Birth Center, 2009). Secondly fewer interventions and procedures take place such as electronic fetal monitoring, epidural anesthesia, and administration of pitocin to augment or induce labor. Lastly, and most significant, is length of stay. For patients with an uncomplicated postpartum and neonatal course, both mother and baby are discharged to home after 12 hours of observation. A home RN goes out to evaluate both and perform routine postnatal screening and maternal evaluation 24 hours after discharge. This is in contrast to in hospital delivery where both mother and baby stay in hospital for 48 hours and incur higher nursing costs, and “hotel” cost as well. Despite the many differences, patient outcomes (maternal and neonatal) are consistent with those of hospital deliveries. Therefore providing care outside of the typical hospital model would allow fewer and less expensive professionals to provide equivalent care in a less expensive setting. It also
provides maternity patients with more options and liberates additional hospital resources for more high-risk obstetric patients.

One criticism of this approach is that the population of inner city Philadelphia is significantly different compared to the suburban area surrounding the Bryn Mawr Birth Center. It is true that many inner city patients will not be appropriate for this model of care. One reason is the relatively strict screening criteria for women that may be allowed to deliver in this setting (Appendix 1). In addition, some may not feel comfortable outside of the hospital setting. But birth centers have been functioning in inner city, low income, minority areas in New York City as well as the Washington DC area for many years (DC Developing Families Center, 2009).

Another obstacle would be the up front costs to build more of these facilities to provide adequate capacity. The estimated cost for building the birth center in Washington DC was $2.1 million dollars (DC Developing Families Center, 2009). Given the potential costs savings with this less expensive model of care, both city and state government as well as the academic medical centers could see financial benefits in the future. A public private partnership could build birth centers in close proximity to each AMC campus. To be operated by the respective academic obstetric departments. More research into this model should be done but it could allow AMCs to improve margins on maternity care, save state Medicaid funds, and provide low-income women with additional delivery options.

**Social Marketing for Maternity Care**

The role of the Philadelphia community in this crisis cannot be ignored. While debate continues to exist regarding the ultimate etiology of the malpractice crisis, some basic connections can be made based on objective data. The city of Philadelphia accounts for a disproportionate amount of medical malpractice awards compared to other areas of the state. Increases in the amount of money paid to settle medical malpractice cases lead to increases in malpractice premiums for medical care providers. High medical liability
premiums have led many community hospitals to stop providing maternity care in the city of Philadelphia. It is likely that further increases in the number and size of judgment amounts will only serve to further limit maternity options for women and families in the Philadelphia area. Many of the plaintiffs and juries that respectively seek and award these judgments will disproportionately feel the effect as all of them live in the city. In addition, many have limited resources and therefore means to access other maternity care providers outside of the city limits. Thus payouts for a relatively small number of families can have serious implications for access to maternity care for the larger population. The question is do residents of Philadelphia understand the connection between these events and subsequent maternity care availability.

While it is true that no other mechanism currently exists to pay for medical care for those injured, it seems unrealistic that the city of Philadelphia is disproportionately affected by medical negligence to the extent that roughly 12% of the states' population accounts for 50% of "CAT fund" claims (Rice, 1998). This seems more unusual in an area home to some of the best medical centers in the nation. To some degree there must be some medical liability suits that simply lack merit. This contention is supported by the fact that even in Philadelphia where physicians lose 45% of the time compared to 10% in suburban and rural areas; roughly 25-30% of malpractice claims are dismissed (Saline, 2002). Therefore the question is why some choose to pursue such claims. It is possible that they do it out of self-interest regardless of the effect on the larger community. What is more likely is that many do not see the connection between their individual case, even if frivolous, and the closure of hospitals in their own city. This attitude is promoted by the numerous plaintiff lawyer advertisements on local media. A possible approach to combat this is a social marketing campaign to make the connections apparent.

“Social marketing is the application of commercial marketing technologies to the analysis, planning, execution, and evaluation of programs designed to influence the voluntary behavior of target audiences in order to improve their personal welfare and that of society”

(Maibach, Rothschild, & Novelli, 2002)
Social marketing is also similar to product marketing in that the techniques are the same and include the four “P’s” of commercial product marketing; product, price, place, and promotion. The distinguishing characteristic of social marketing is that the ultimate goal is to change a social behavior whereas commercial marketing has as its’ goal to promote the use of a specific product or service. Another component of Andreasen’s definition is most fitting with respect to social marketing and the Philadelphia maternity crisis:

“The primary beneficiaries of social marketing programs are members of the target market themselves, or society at large, rather than the person or the organization that initiated the marketing program.”
(Maibach, Rothschild, & Novelli, 2002).

In this case the product is improved and continued access to maternity care. The price is a consideration of the larger impact an individual medical liability lawsuit would have on the city and access to maternity care before proceeding with such action. The place includes the entire city focused on venues where women receive maternity care in the city of Philadelphia including the AMCs and city health centers. Promotion would include advertisements on local television, radio and on mass transit locations. It should be specifically targeted at those persons with limited transportations options as they are most affected. Any activities to promote this behavior would have to be undertaken by local government or non-governmental organizations, as any effort by AMCs or other medical providers would obviously seem self-serving.

It is unclear how effective, if at all such a campaign would be, but not addressing this aspect of costs to the maternity care system would be ignoring a significant part of the problem. Even if such a program did not lead to reduced numbers of individual lawsuits, it might lead to more political support for more substantive change of medical malpractice law on a state level.
VIII. Conclusion

In order to prevent further erosion of the maternity care infrastructure in Philadelphia a sustainable model to provide high quality, accessible maternity care for all women must be developed. This model especially needs to take into account those who do not have access to the remaining community hospitals outside of the city. It will require the continued, strong presence of the academic obstetrical departments in the city, and cooperation among them. So that these facilities can continue to fulfill their complete mission of providing high quality care, performing innovative research and teaching the next generation of medical providers in order to move the practice of medicine forward, they will require assistance as well. Only with the collaborative efforts of local government, academic medicine, and the community, can this occur. The other option will lead to a decrease in quality and options for maternity patients of today and less robust educational opportunities for medical professionals of the future in the city of Philadelphia.
Table 1.

*Philadelphia Maternity Unit Closures 1997-2009*

<table>
<thead>
<tr>
<th>Maternity Unit</th>
<th>Year of Closure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical College of Pennsylvania</td>
<td>1997</td>
</tr>
<tr>
<td>Nazareth</td>
<td>1998</td>
</tr>
<tr>
<td>Germantown</td>
<td>1999</td>
</tr>
<tr>
<td>City Avenue</td>
<td>1999</td>
</tr>
<tr>
<td>Roxborough</td>
<td>1999</td>
</tr>
<tr>
<td>Warminster</td>
<td>2000</td>
</tr>
<tr>
<td>Elkins Park</td>
<td>2001</td>
</tr>
<tr>
<td>Episcopal</td>
<td>2001</td>
</tr>
<tr>
<td>Mercy Philadelphia</td>
<td>2002</td>
</tr>
<tr>
<td>Methodist</td>
<td>2002</td>
</tr>
<tr>
<td>Mercy Fitzgerald</td>
<td>2003</td>
</tr>
<tr>
<td>Parkview</td>
<td>2003</td>
</tr>
<tr>
<td>Frankford-Torresdale</td>
<td>2006</td>
</tr>
<tr>
<td>Jeanes</td>
<td>2007</td>
</tr>
<tr>
<td>Chestnut Hill</td>
<td>2008</td>
</tr>
<tr>
<td>Northeastern</td>
<td>2009 (Planned 6/30)</td>
</tr>
</tbody>
</table>
Table 2.

*Academic Medical Centers Providing Obstetric Services in Philadelphia*

<table>
<thead>
<tr>
<th>Hospital</th>
<th>Academic Affiliate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albert Einstein Medical Center</td>
<td>Jefferson Medical College</td>
</tr>
<tr>
<td>Hahnemann University Hospital</td>
<td>Drexel University COM</td>
</tr>
<tr>
<td>Thomas Jefferson University Hospital</td>
<td>Jefferson Medical College</td>
</tr>
<tr>
<td>Pennsylvania Hospital</td>
<td>University of Pennsylvania SOM</td>
</tr>
<tr>
<td>Hospital of the University of Pennsylvania</td>
<td>University of Pennsylvania SOM</td>
</tr>
<tr>
<td>Temple University Hospital</td>
<td>Temple University SOM</td>
</tr>
</tbody>
</table>
Medical Professionals required to staff perinatal care center (Level I-III)

<table>
<thead>
<tr>
<th>Profession/Specialty</th>
<th>Post high school education(yrs)</th>
<th>Median Salary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Registered Nurse</td>
<td>2-4</td>
<td>$57,000</td>
</tr>
<tr>
<td>Certified Nurse Midwife</td>
<td>6</td>
<td>$84,000</td>
</tr>
<tr>
<td>Certified Nurse Anesthetist</td>
<td>6-7</td>
<td>$135,000</td>
</tr>
<tr>
<td>Family Practice w/OB</td>
<td>11</td>
<td>$182,000</td>
</tr>
<tr>
<td>Obstetrics/Gynecology</td>
<td>12</td>
<td>$211,000</td>
</tr>
<tr>
<td>Anesthesiologist</td>
<td>12</td>
<td>$207,000</td>
</tr>
<tr>
<td>Neonatologist</td>
<td>14</td>
<td>$286,000</td>
</tr>
<tr>
<td>Maternal Fetal Medicine</td>
<td>15</td>
<td>$286,000</td>
</tr>
</tbody>
</table>
Table 4.

*NIH Dollars and Number of Grants to Philadelphia Academic Medicine Departments FY’ 2008*

<table>
<thead>
<tr>
<th>Academic Institution</th>
<th>Dollar Amount Awarded</th>
<th>Total Number Grants</th>
</tr>
</thead>
<tbody>
<tr>
<td>University Pennsylvania</td>
<td>366,095,859</td>
<td>834</td>
</tr>
<tr>
<td>Thomas Jefferson University</td>
<td>62,583,370</td>
<td>187</td>
</tr>
<tr>
<td>Temple University</td>
<td>33,795,916</td>
<td>98</td>
</tr>
<tr>
<td>Drexel University*</td>
<td>23,127,814</td>
<td>69</td>
</tr>
</tbody>
</table>

*Drexel University only 2005 data available*
References:


Accreditation Council for Graduate Medical Education. (2008). *ACGME Program Requirements for Graduate Medical Education in Obstetrics and Gynecology*. Chicago, IL: Accreditation Council for Graduate Medical Education.


Standards for Accreditation of Medical Education Programs Leading to the M.D. Degree. (2008). Washington DC: Liaison Committee on Medical Education.


Appendix 1

The Birth Center At Bryn Mawr Screening Criteria

ABSOLUTE CONTRAINDICATIONS TO CARE AT THE BIRTH CENTER

- Severe chronic medical disease.
- Severe chronic psychiatric disease.
- Current drug or alcohol addiction.
- Rh isoimmunization.
- Gestation greater than 28 weeks without prior prenatal care.
- Insulin dependent diabetic.
- Essential HTN.
- Multiple gestation.
- Previous incompetent cervix
- Previous operative procedure on the uterus and past 28 weeks gestation.

(To be removed as an absolute contraindication if consultant physician coverage available for delivery of VBAC clients in future.)

Revised 6/2008

HISTORY REQUIRING CONSULT WITH OB BEFORE ACCEPTANCE FOR CARE AT THE BIRTH CENTER

- History of previous delivery prior to 35 weeks gestation.
- Previous placental abruption, retained placenta or severe postpartum hemorrhage
- Current malignancy.
- History of DES exposure.
- Previous deep vein thrombophlebitis
- Previous unexplained 3rd trimester stillbirth.

Revised 6/2008

AP COMPLICATIONS REQUIRING TRANSFER FROM THE BIRTH CENTER TO MD CARE.

- Multiple pregnancy.
- Development of insulin dependent diabetes.
- Development during pregnancy of severe medical disease.
- Ectopic pregnancy.
AP COMPLICATIONS REQUIRING OB CONSULT

- Gestational diabetes.
- PIH.
- Abnormal presentation at term.
- Active genital herpes at term.
- Second or third trimester uterine bleeding.
- PTL
- First trimester incomplete miscarriage with greater than 9 week size fetus, or with heavy bleeding.
- Diagnosed fetal congenital defect.
- Development of other severe medical or surgical problems.
- Oligo or polyhydraminos.
- LUGR.
- IUFD.

Revised 6/2008

CONDITIONS REQUIRING DELIVERY AT HOSPITAL

- Non vertex presentation.
- PTL (less than 36 weeks).
- Chorioamnionitis.
- Gestation greater than 42 weeks.
- PIH.
- Fetal distress - birth not imminent.
- Heavy mec staining - birth not imminent.
- EFW less than 5# 8 oz.
- Severe macrosomia.
- Cord prolapse.
- Dysfunctional labor
- Oligo or polyhydramnios
- IUFD
- IUGR
- Intrapartum hemorrhage
- Development if other severe medical or surgical problems

Revised 5/2008

CONDITIONS REQUIRING CONSULT POSTPARTUM

- Endometritis not responsive to or too severe for po antibiotics.
- Development of PIH
- PPH with unstable vital signs.
- Retained placenta.
- Laceration beyond expertise of CNM to repair.
- Development of other severe medical or surgical problems.
INFANT CONDITIONS REQUIRING PEDIATRIC CONSULT AND POSSIBLE TRANSFER TO HOSPITAL

- Weight less than 5# 8 oz
- Apgar less than 7 at five minutes
- Respiratory distress.
- Persistent hypothermia.
- Congenital anomaly.
- Persistent hypotonia.
- Seizures.
- Persistent hypoglycemia.
- Any condition requiring more than 12 hours of observation.
- Maternal infection.
- Any baby born at The Birth Center under 5# 0 oz. will be transferred to Bryn Mawr Hospital.

(Time of transfer and place (NICU, normal nursery, Peds) will be determined by the on-call Pediatrician and or Neonatologist.)

Revised 2/2001