

**Financial Benefits of the Community Health Access Program:
Cost Savings through Reductions of Emergency Department Visits and Hospitalizations**

A Final Report Prepared for the Delaware Health Care Commission

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April, 2003

EXECUTIVE SUMMARY

1. The analysis of financial cost savings for the reduction in emergency department (ED) visits and hospitalization due to the implementation of the Community Health Access Program (CHAP) encompassed the first year of program's operation.
2. The best estimate of ED savings is that the program saved a net of 59 ED visits, with the realization of approximately \$18,000 in cost savings. This figure includes 85 reduced ED visits attributable to CHAP less 25 increased visits after CHAP enrollment began.
3. The best estimate of hospitalizations saved is 4 avoided hospitalizations, at an estimated savings of \$50,000.
4. Hospital length of stay (LOS) could not be analyzed because of lack of data.
5. As discussed in the report, the financial cost savings does not address the long run financial medical care costs that could be avoided as well as the reduction of some social costs that CHAP eligibles incur seeking medical care.

TABLE OF CONTENTS

I. Purpose	5
A. CHAP: Program Purpose and Orientation	5
B. Two Expected Impacts of CHAP	6
II. Emergency Department (ED) Analysis	6
A. Overcrowding of EDs	7
A1. Overcrowding of Urgent Services	8
A2. Overcrowding of Non-Urgent Services	8
B. Financial Status of EDs	9
C. Quality of Health Care	10
D. ED Utilization and Cost Characteristics	11
E. Implications for CHAP	15
E1. Overcrowding	15
E2. Timing and Nature of Visits	16
E3. Quality of Care	16
E4. Costs of Medical Care	17
F. Evaluation for CHAP	18
F1. Previous Studies	19
F2. CHAP Cost Savings Estimation Classifications of Non-Urgent Visits Avoided Non-Urgent ED Visits Cost Determination	20
F3. AC Estimates AC of ED Visits AC of Physician Visits Utilization and Estimates	23
G. Alternative Sources of Care	31
G1. Increase Physician Access	32
G2. Fast Tracking	32
G3. Increased Access to Urgent Centers and Community Healthcare Facilities	33
G4. Reconfiguration of the ED as a Primary Care Unit	34
G5. Expansion of DHCP	34

III.	Inpatient Hospitalization Analysis	35
A.	Cost Savings Perspectives	35
A1.	Avoidable Hospitalizations	36
A2.	Hospital Admissions	36
A3.	AC Determination	38
A4.	MC Estimation	40
IV.	Conclusion	43
	Bibliography	44

I. PURPOSE

This report describes the evaluation of whether financial cost savings have been (and can be) realized through the implementation of the State of Delaware's Community Healthcare Access Program (CHAP). The program objective is to provide subsidized access to primary care physicians for those adults who do not have health insurance and have a household income between 101% and 200% of the Federal Poverty Level (FPL). Two potential sources of financial cost savings have been investigated: the determination of cost savings that could be realized in both reduced emergency department (ED) usage and reduced hospitalization by CHAP enrollees. The analysis encompasses evaluation of participants who were enrolled for at least six months to a year (two consecutive six month periods) in the first year of CHAP. The ED analysis is taken up first followed by the hospitalization analysis.

A. CHAP: PROGRAM PURPOSE AND ORIENTATION

CHAP is a medical care subsidy/assistance program sponsored by the Delaware Health Care Commission and funded by a grant from the Health Resources and Services Administration. Enrollment in CHAP began on June 11, 2001. The objective of CHAP is to connect adult individuals (18 years old and above), without health insurance and household income between 101% and 200% of the Federal Poverty Level (FPL) with a primary medical home (physicians in offices/organizations/sites). For individuals certified as eligible, the CHAP program has a network of primary medical homes that have agreed to take (eligible) patients at no cost or on a sliding (scale) fee. The medical providers are conveniently located and affordable for an individual or family.

A participant's status is verified by an application, denial of Medicaid eligibility, required FPL income level, and absence of health insurance. Most recruitment has occurred at emergency rooms and Federally Qualified Health Centers located throughout the State of Delaware. At these locations/sites, to facilitate enrollment, interviews of users of medical services were conducted for determination of CHAP eligibility by a statewide network of "care coordinators—or patient advocates". The surveys included questions about an individual's health status, access and utilization of medical services, and health insurance status in addition to socioeconomic characteristics. If individuals met the enrollment criteria, they received an identification card that denotes their uninsured status and they had been through the CHAP public assistance screening process. Eligibility certified by a patient's enrollment card enables them

to other benefits, --150 free or reduced cost specialty services. Discussion was underway in early 2002 for discounted diagnostic services (lab and x-ray).

B. TWO EXPECTED IMPACTS OF CHAP

The primary objective of CHAP is to provide permanent source of primary healthcare for those who cannot afford health insurance--, i.e., CHAP eligible individuals. Two impacts are expected from having a primary healthcare home made available to CHAP enrollees. One, the availability of routine preventive care and sick care visits through a primary care home should reduce or eliminate inappropriate non-urgent use of emergency department services by enrollees. That is, visits to the primary care home visits and ED visits should be substitutes, with the former replacing the latter. Reduction of emergency department usage could produce financial cost savings for the health care system, if as expected, the costs of emergency care services would be greater than the costs incurred for a corresponding physician office visits. Two, the continuous access to care obtained through participating CHAP physicians could provide medical treatment for illnesses or medical care for maintaining health status so that illness would be prevented or the severity of it would be lessened. The consequence could be that hospitalization for illness could be avoided. Avoidable hospitalization would result in financial cost savings simply because the outlays for a hospital stay would not be incurred since the enrollee would not be admitted to the hospital due to the use of primary care.

II. EMERGENCY DEPARTMENT (ED) ANALYSIS

As aforementioned, one expected impact of CHAP is that CHAP enrollees would decrease their ED utilization for non-urgent care and, as a consequence, a reduction in the financial costs of health care society could be realized. These expected outcomes are linked to a set of major, interrelated and overlapping, health care issues and activities, each of which could impinge upon the CHAP objectives of realizing efficacious and cost effective health care for program enrollees. These issues and activities are: (1) ED overcrowding, (2) the financial status of EDs (3) quality of medical services of enrollees, (4) the structure, service delivery, and utilization characteristics of EDs that shape their financing and costs, and (5) alternative sources of health care. Together these considerations, especially this last consideration, can determine whether cost savings can be realized if CHAP enrollment results in less ED utilization. There is

an overarching policy question that is entailed in the review of the five considerations. Are there greater financial and non-financial costs and benefits of providing types of care in ED instead of other settings? Some disagreement exist on the answer to this question in the literature on ED utilization, with the weight of evidence and support for non-ED based medical services for non-urgent care.

A. OVERCROWDING OF EDS

One consensus in the health care literature is that overcrowding plagues ED utilization. Overcrowding is generally interpreted as EDs having large volume of visits within a specific time period so that patients are queued for service and must wait a considerable time before they can receive assistance.¹ A common proposed solution by many researchers has been to initiate programs for uninsured ED users, such as eligible CHAP enrollees, because they are part of and contribute to the overcrowding of EDs through their non-urgent utilization. An ancillary issue is that any **insured** individuals who also utilize the ED for non-urgent care could be sources of ED overcrowding. This perspective points to the bases of improved health outcomes via programs like CHAP, which have potential to mitigate overcrowding by reducing the number of ED users through the provision of primary care at alternative sites. However, the extent to which CHAP enrollment can yield reduction in non-urgent visits, and as a **by-product**, can reduce **ED overcrowding**, may be restricted by nature of ED utilization that has changed over the past 20 years. How precisely these dimensions and their changes apply to individual EDs of Delaware is difficult to document, since required detailed data on their utilization was unavailable.

From 1985-1990, the uninsured used EDs at higher rates than insured, and a major reason for the growth in ED utilization throughout the United States was due to uninsured individuals seeking medical care (GAO, 1993). In the early 90s, the increased number of uninsured and Medicaid population added to rising utilization and overcrowding of EDs, and produced avoidable health care costs. These individuals generally sought medical care for non-urgent care services, although some were diagnosed with need of urgent care. From the mid-90s to present, (except for California) the utilization, financial costs, and overcrowding of EDs has been due to a confluence of forces.

¹ The word overcrowding is employed substantially in the literature, and congestion is sometimes used as a synonym. Overcrowding conveys that there is crowding to the point of congestion.

A1. Overcrowding of Urgent Services

The demand for emergency services by individuals requiring urgent medical care has increased (Shactman and Altman, Jan. 22, 2002) since the late 1990s. That is, the total number of visits for urgent services in EDs has risen. This increased “urgent” utilization of EDs has coincided with the absolute decline in the number of inpatient short-term hospital beds. Managed Care has produced pressure on hospitals to control their financial costs, and it has resulted in hospital closures nationally, and a cut in many available patient beds in a large number of the remaining hospitals. At the same time, the demand for acute inpatient care has also increased. The aging population has grown larger in the 1990’s and it has required more hospitalization that is brought about by illnesses which accompanies the longevity of life.

Because inpatient hospital beds are filled, ED beds are occupied by more urgent cases who need hospital admission but must wait hours before being admitted. Avoidance of hospitalization through extensive therapy has been practiced in EDs with the consequence that patients spend longer time in ED beds and awaiting discharge (Derlet, 2002). Also, ED urgent cases are more labor intensive with the consequence that patients require monitoring by nursing and physician staff. At the same time as managed care has been implemented, a nationwide nursing shortage has occurred. There are two consequences. First, EDs are understaffed so that their capacity is limited for treating patients having urgent needs. Secondly, the turnaround time for ED beds has become lower. Because of the resulting ED congestion of urgent cases, ED diversions have occurred, whereby ambulances carrying patients with urgent care are diverted to other hospitals.

A2. Overcrowding of Non-Urgent Services

During this period of ED **urgent** overcrowding, a substantial increase in **non-urgent** visits (for illness and routine care) has occurred by both insured and uninsured individuals. The uninsured were four times as likely as the insured to use EDs. This rising utilization, together with decreased ED capacity, has curtailed the ED ability to deal with the increase in less urgent cases (Derlet, 2002). Most of these services for non-urgent conditions can be treated in primary care settings (Weinick, et al., 2001). Many studies verify that a large proportion of patients themselves do consider their ED utilization for their conditions require urgent services (Gill, 2001; Weinick, et al., 2001).

The primary reasons for rising non-urgent ED utilization are several and interrelated. First, the EMTALA (Emergency Medical Treatment and Active Labor Act), passed in 1986 and strengthened in the

1990s, stipulates that any hospital that accepts Medicare patients (virtually all community hospitals) must treat any patient that arrives at an ED without regard to illness and ability to pay. Second, “prudent lay person” laws have been passed in 33 states. These laws mitigate barriers to non-urgent ED utilization since they require insurance plans to pay ED bills if the insured patient is in great pain or believes he/she is in a medical emergency. Third, in some states, rural areas may not have geographically accessible urgent centers so that non-urgent care can be received. Fourth, much non-urgent ED utilization may be indicative of poor accessibility to primary care (Weinick, et al., 2002). Some analyses document that this non-urgent utilization (by both insured and uninsured individuals) is due to the inability to obtain physician care or clinic appointment at the time of need, --evenings, weekends, non-work days, transportation barriers (Cunningham, Young, and Wagner, 1995). The uninsured have limited ability to obtain medical care from alternative providers due to the affordability of health care, especially the purchase of health insurance, and thus the ED is the available means for obtaining medical care (Lucas and Sanford, 1998; Young, et al., 1996; Weinick, 2001). Affordability hinders their access to a permanent source of care for preventive services and routine illness care. Uninsured individuals are considerably more likely to report access problems than Medicaid patients or individuals with private health insurance (Grumbach and Bindman, 1993). Nevertheless, both financial and non-financial access problems occur more frequently among those **without regular clinicians**, whether they are insured or uninsured (Young, et al., 1996). Individuals who lack a continuous relationship with a primary care physician has been associated with higher ED utilization for selected **non-urgent** conditions, regardless of insurance status (Petersen and Burstin, 2001), and decisions to delay needed care are related to not having a regular physician (Rucker, et al., 2001).

B. FINANCIAL STATUS OF EDs

Despite overcrowding due to urgent and non-urgent conditions, hospitals and healthcare institutions have been unwilling to expand EDs because they have not been profit centers since the implementation of Managed Care. Prior to the mid-1990s, subsidized care was given to people who could not afford to pay for the services and were without health insurance. Charging higher fees to insured patients financed such subsidies, thereby shifting much of the financial burden to insurance companies. Cost shifting has been severely limited in the Managed Care era because MCOs have pressured hospitals to restrict unnecessary expenditure. EDs have been a large target of the managed care movement since 7% of health plan budgets have been allocated to ED utilization, and ED services cost approximately 6 times more

than the same care delivered in physician offices, --an issue addressed below (IBID; Weinick, et al., 2001). Medicare and HMOs are not a source of payment for uncompensated care since they pay fixed or discounted amounts (ACEP, 2000). Because cost shifting has been severely restricted, many EDs and their hospitals have encountered financial difficulties. Unable to collect charges that cover the costs of many visits, especially by uninsured, many EDs have operated with resulting deficits, which are funded by hospitals and/or government.

The American College of Emergency Physicians argue that uncompensated care is a legitimate practice expense for emergency services, and charges above service costs could be substantially reduced if the government as third-party payers provided health care coverage for the non-insured so that they could utilize ED services when needed (ACEP, 2001). If such an approach were taken, then **it would seem**, in effect, that the ED would supplant the need for provision of alternative primary care sites for uninsured.

C. QUALITY OF HEALTH CARE

The ED is a source of accessible and readily available care for the low-income population who are without health insurance, and have limited, if no other, alternatives to obtain medical services on a regular basis. In this respect, EDs play a vital role in health care as a safety net for its users, regardless of insurance (Weinick, et al., 2001). More specifically, for users of non-urgent services, the ED is a **substitute** for **primary care**, especially the uninsured (IBID.). As a continuous source of medical services, however, primary care can provide patients with initial contact in the health care system, comprehensive and coordinated health care, and a sustained partnership with patients (Starfield, 1992). Greater continuity of health care through primary care has been associated with improved health outcomes of patients, and has resulted in less utilization of ED services (Grumbach, et al., 1993; Gill, 1998, 2000). Conversely, as mentioned above, the absence of a continuous connection with a primary care physician has been associated with ED utilization for **non-urgent** conditions for both insured and uninsured individuals (Petersen, et al., 1998). Likewise, patients that experience continuity of care have fewer hospitalizations (Gill, 2000). These positive impacts are generated not only by patients using physician offices but also those participating in Federally Qualified Health Centers as the primary source of care who had significantly less ED utilization and fewer hospitalizations (Falik, 2001).

In addition to increased health care provision, **social costs** are also incurred because of non-urgent ED utilization. In the short run, ED users impose an external burden on others because of the congestion

caused by the volume of their visits. Large scale ED utilization and its congestion impose several externalities on others. First, the volume of visits at any point in time results in queuing for services, which in turn causes prolonged waiting time to acquire care. Thus for the waiting time to be served ED users unnecessarily relinquish time that could be spent more productively by engaging in alternative activities. Second, as the waiting time for medical attention increases, people in pain from their illness/injury will experience increased suffering. Third, the ED is viewed as an unpleasant therapeutic environment (Bindman, 1991; Shactman and Altman, 2002) and treatment in it when overcrowding prevails produces lower patient satisfaction (IBID). Fourth, because of waiting time, some ED visitors leave the site without receiving treatment; the negative impact of this behavior, which is indicative of quality of care, before the health status of these individuals is unknown, due to the lack of empirical studies on the activity, but it could be substantial. Fifth, overcrowding has been found to be associated with increased medical errors (Derlet and Richards, 2000).

The quality of care obtained from ED utilization affects financial dimensions of the health care system. First, unnecessary costs are incurred for ED services. Some ED service provision is characterized by over-utilization that leads to unneeded costs. Utilization review for patients is not undertaken, and ED clinicians are unfamiliar with patients and their records. Therefore, some patients are often given extensive diagnostic tests that might be otherwise unnecessary. That is, the extent of services rendered in the ED would not be provided in a primary care home due to the physician's knowledge of a patient's health problems and status. The result is increased spending for patients' medical care (Baker 2002). This expenditure has been estimated to be approximately at least 3 times more than the same care delivered in physician offices (Weinick, et al., 2001). Second, individuals who utilize EDs and return to them for additional care, often within 7 to 14 days, are usually admitted to a hospital through the ED (Baer, 2001; Bindman, 1991; Shactman and Altman, 2002), and these individuals have longer length of stays in the hospital (Baer, 2001).

D. ED UTILIZATION AND COST CHARACTERISTICS

The organizational requirements for ED service provision determine the cost structure of EDs. Moreover, in their operations, EDs realize several types of costs. ED costs and utilization are also intertwined, however. The nature of utilization determines the values of the different types of costs. **These costs are crucial to the determination of whether CHAP can produce financial savings.** To offer

insight into the basis of cost savings behavior, a hypothetical example with an accompanying diagram is provided.

The objective of providing urgent service delivery requires having plant (a building), equipment, and medical staff available on a contingency basis for potential use for patients (even though all items may not be used in every service). Most commonly EDs are housed in either separate detached buildings or in a part of a hospital, and they are outfitted with large scale and expensive equipment acquired for diagnoses and treatment when needed. The building costs incurred on an annual basis may be rental (mortgage) payment, or imputed rent paid to hospital. Likewise, equipment may be purchased outright or require set payments on a periodic basis. EDs are staffed with medical personnel--physicians, nurses, orderlies, and administrators-- who are hired for set hours/shifts and may be under contract for specific time frame, generally annually. Although the building facility and equipment are ever present and invariable in availability, staffing is adjusted to the expected demand that arises by time of day or week and therefore not constant in composition or assignment for different daily work (labor) shifts.

FIGURE 1

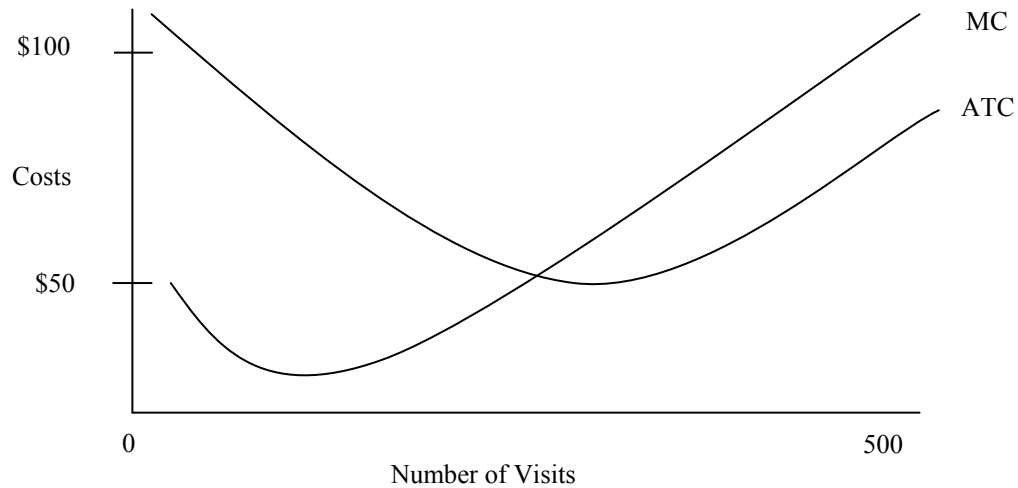


TABLE 1
HYPOTHETICAL COSTS OF AN EMERGENCY DEPARTMENT

Fixed Costs	Annual Costs
1. ED Building/Facility Imputed Rent	\$1,500,000
2. Equipment – Annual (Debt) Payment	\$2,500,000
3. Staff – Physicians, Nurses, Orderlies	\$1,800,000
4. Total Fixed Costs (TFC)	\$5,800,000
Variable Costs (VC)	
5. Pharmaceuticals	\$200,000
6. Equipment Supplies	\$180,000
7. Medical Supplies	\$150,000
8. Administrative Materials	\$100,000
9. Total Variable Costs (TVC)	\$630,000
10. Total Costs (TC)	\$6,430,000
VC/TC	9.8%
FC/TC	90.2%

Consequently, ED operations are conducted with substantial *fixed costs* (FC), whose **total** dollar value are constant over a period of ED operations, for example, a year. These **total** costs are incurred and do **not vary**, irrespective of the number of patients served or number of services performed. In this sense, these fixed cost of EDs are commonly referred to as **standby costs** that are paid for items that must be available for a period of 24/7 or 24 hours a day for seven days a week for potential demand, even if the number of patients vary.

While ED operations are conducted with substantial fixed costs, their *variable costs* (VC) are low in total value and as a proportion of total (fixed plus variable) costs. Variable costs are the dollar value of items generally in the form of materials and supplies (e.g., pharmaceuticals, equipment supplies and medical items) that are employed for each patient. The amount of variable costs varies by each patient's service need, and it rises with the increase in the number of patients treated.

EDs recoup FC and VC through **charges** based on the expected number of patients to be served. Assuming all patients pay for their services, a patient is charged the VC for his treatment plus his/her share of the FC (i.e., FC/number of patients). In this situation, the FC per patient is an **overhead charge** to cover the costs of having ED facilities available for service provision to the patient. **Total** FC (TFC) will always be the same for the (annual) period and does not change according to the number of patients (in the short-run). At the same time, average FC per patient will decrease (increase) as the number of visits increase (decrease), since FC can be spread among more treatment episodes.

Unless EDs are restricted, if the number of expected patients who pay their bills are estimated to be lower than the number of expected total patients, the TFC and the estimated VC not paid will be allocated among a smaller number of paying patients. This action results in **cost shifting** of the bills of non-paying customers to the paying patients who would incur charges greater than the cost of services that they received. As mentioned above, such cost shifting may have been constrained considerably with the implementation of Managed Care; as a consequence, ED costs for services and the charges for them may not diverge to the extent that third party payers have been forceful. Without the ability to recoup the costs of non-paying patients, then EDs will operate and have operated in the red. Such deficits may require subsidies by the hospital or government. An ED has financial interest in increasing the number of visits for two reasons. One, with a larger number of visits, more fixed costs can be covered, and thus financial vulnerability can be reduced; and moreover, standby costs of treatment can be reduced per patient, thereby lowering the charges to patients. Two, to the extent cost shifting is not inhibited, then more fixed costs can be allocated to a larger number of patients and therefore financial losses due to nonpayment can be mitigated.

If TFC and VC of all patients were added together, e.g., for a year of ED service provision, the total costs of ED services ($TC = TFC + TVC$) would be obtained. Then the **average costs** of service provision (AC) in the ED can be derived by dividing TC by the total number of patients. **AC differs from the marginal costs (MC) of ED operations.** MC is referred to sometimes as the incremental costs; it is the increase in the cost that results from producing an extra unit of output. Specifically for EDs, MC is the extra costs it takes to treat the next patient who enters the ED, or put differently, MC indicates how much it will cost to provide care for one additional patient. Marginal cost is measured as the **change** in VC divided by the **change** in the number of patients. Fixed costs are excluded from MC, since the total value of FC does not change as the number of patients change. MC figures can be calculated for the service provision of one more patient or for the service provision of a range of additional patients. Conversely, the MC of a ED would allow the determination of the amount of cost reduction that would occur if the treatment of one patient or a number of patients were decreased. The MC of EDs manifests a pattern; MC declines over an initial range of patients treated, and then rises for the remainder of patients. At some point in the rise of MC, its dollar value exceeds the dollar value of AC. Consequently, the MC of treating a range of patients could be higher or lower than the AC of treating them, depending upon the number of patients that is

treated. MC would be equal to AC, if EDs and hospitals operated in perfectly competitive market--, a condition that does not prevail in the U.S. and Delaware.

Although MC can be determined for an entire ED operation, the resulting figure may not accurately represent the nature of the activities that occurs within an ED. In sum, the MC that is incurred for an additional patient or range of visits depends upon the utilization behavior of the ED. The utilization of EDs by insured and uninsured individuals for either urgent or non-urgent conditions manifest irregularity. The types and volume of visits may be random by the day of the week and by time of day. There is a lack of empirical evidence on how non-urgent demand and utilization of EDs is distributed during the week and by the time of day. Utilization can vary substantially during a day from periods of overcrowding to time with few patients. Generally researchers conclude that utilization is considerably less in the very late evening and early morning hours (or off peak times), viz., 10:00-12:00 PM and 1:00 to 6:00 AM. Thus the MC could be low in off peak times where VC are small over the time frame (and no additional FC). The inverse is MC could be high in peak times, e.g., in the early evening, where there are large number of visits (especially non-urgent ones) and the VC are larger in the time frame.

E. IMPLICATIONS FOR CHAP

E1. Overcrowding

1. The overcrowding of EDs cannot be attributed solely to non-urgent visits by insured and non-insured individuals (inclusive of individuals who would be eligible for CHAP enrollment). **Urgent** visits to EDs also contribute to overcrowding of the facilities.
2. The extent to which limitations of available acute inpatient beds hinders the rapid treatment and transfer of urgent cases, a reduction in non-urgent visits will not eliminate or substantially mitigate the overcrowding of many EDs (Shactman and Altman, 2002). Due to the priority of urgent conditions and the volume of such visits, even a reduced number of non-urgent visits could entail queuing for the latter group of patients.
3. If the provision of a primary care home via CHAP could restrain non-urgent ED visits of the enrollees, then overcrowding would also be alleviated so that more immediate service provision could be given to those with non-urgent conditions but in greater medical need.

E2. Timing and Nature of Visits

1. Any policy to reduce ED non-urgent visits should be directed at **repeat** users of ED services, since they are contributors to congestion and overcrowding of the ED. If their visits are curtailed, there is potential to realize social gains (inclusive of financial cost saving and increased social benefits) for the health care system through the provision of alternative sources of care.
2. Even if some alternative sources of care were available, e.g., CHAP, some volume of non-urgent ED visits may not be readily amenable for reduction due to the time in which individuals can obtain medical care. Care required in and visits made purposely for the evenings or weekends will still be demanded by insured and uninsured unless the alternative sources of medical care visits were provided at the corresponding time of ED visits.

E3. Quality of Care

1. A reduction in non-urgent ED utilization could mitigate the social costs or social burdens-- e.g., time saved by patients, --that arise from resulting overcrowding of such visits. Such reduction, which would be expected from CHAP implementation, would yield value to both ED patients who would no longer use the ED (and obtained alternative care), and ED users that continued to utilize the ED.
2. The American College of Emergency Physicians argue that EDs are more efficient than alternative medical sites in diagnosing certain medical conditions because of the availability of such advanced services inclusive of diagnostic imaging, laboratory facilities, pharmaceutical and other specialists, all of which facilitates the treatment process (ACEP, 2001). This argument is very likely to be applicable only to urgent problems for which tests and their results are needed quickly. Even if ED utilization provides such services for non-urgent problems, and the visits are less costly than the corresponding substitutable visits through CHAP-- (i.e., the short-run cost issue), -- the retention of ED provision of non-urgent care must be that weighed against the quality of health care that repeat ED users would receive under CHAP.

- Individuals would have direct access to primary care, which would provide a continuity of care.
- Primary care would allow services for preventive measures, early diagnosis, and early medical intervention, which is not available under the utilization of EDs, given their present configuration and purpose.
- Individuals who use the ED for primary care are likely to have poorer health care outcomes, -- viz. less hospitalization, less severe illness, and greater health status, -- than those individuals that have a primary care home, as would be provided through CHAP.

E4. Costs of Medical Care

1. The American College of Emergency Physicians state that the average costs of an ED visit is comparable to private physician office, if the “extra” stand-by costs associated with being available 24 hours a day is excluded from consideration (ACEP, 2001).
 - However, these fixed costs are considerable in monetary value and they are passed along, in the form of charges, to insured and uninsured ED patients who obtain non-urgent medical services.
 - Even if physician service costs for the same condition are comparable in the ED and at primary care sites, ED physicians order more tests—and more expensive ones—for the patients so that non-physician medical costs are higher.
2. Because EDs include fixed costs in their billing for ED services, the average costs of ED services is substantially higher than a primary care physician office or other outpatient facilities (Weinick, et al., 2001). Some analyst estimate the prices charged for non-urgent services in EDs to be three times the prices in outpatient settings (IBID; Baker 2002; Baker, HHS OIG Report1983, NCHS Report 1994).
3. These two prices may not be comparable because the ED utilization may entail the provision of more services than would be given for the corresponding visit at a patient’s primary care home. As indicated above, these “extra” services may not be provided at the primary care site so that more costs is incurred for ED services.

4. Where the insured are users of ED for routine care, a long-run outcome is likely to be higher insurance costs and patient copayments, given that the costs and charges for ED services are considerably greater than alternative primary care service (Shactman and Altman, 2002).
5. As supported by recent empirical evidence, by providing a primary care home for repeat ED users, CHAP should generate financial savings in the long-run through avoidance of higher future medical care costs arising from late diagnoses and intervention and because of avoided hospitalization.

F. ED EVALUATION FOR CHAP

Determination of the financial cost savings obtained by CHAP through the reduction of ED utilization is problematic. Difficulty is encountered given: (a) the present state of empirical research of ED utilization, (b) the limited nature and time frame of empirical studies of ED activities, (c) the lack of empirical data on ED utilization and costs in national health care data sets, and (d) the lack of appropriate Delaware data collected for the CHAP program. These issues are addressed in this section. First, previous studies of the costs of ED utilization are reviewed briefly to indicate the existing state of research and their applicability to the question of cost savings derived through CHAP. Second, the analytical requirements to investigate CHAP financial cost savings are addressed with commentary on the appropriateness of available CHAP data, past research, and availability of national data to answer the research questions, as well as the methodological requisites for conducting the financial cost savings analysis. Finally, some empirical estimates regarding ED utilization under CHAP are given.

As stated above, CHAP financial cost savings would be realized if the money costs of primary care home visits made available due to CHAP enrollment were less than the costs of ED visits that were replaced by CHAP participation. This analysis excludes consideration of the social costs of ED utilization, primary care continuity, and the long-run costs due to lack of primary care. **If any of these issues were considered as part of CHAP enrollment, each would generate additional benefits of the program.**

F1. Previous Studies

Despite the recent interest (within the past 10 years) in ED utilization as a health care financing issue, there has been limited investigation of the cost dimensions of EDs. First, two studies have focused on the differences of charges or prices between ED utilization and utilization of physician offices. One approach has entailed the comparison of physician services with ED utilization of both urgent and non-urgent services combined (Weinick, et al., 2000, 2001). Employing data from the National Medical Expenditure Survey of 1987, a second approach calculated the charges for both (a) first time physician office visits, and (b) non-urgent ED services, classified according to ICD-9 codes and based on patient diagnoses (Baker and Baker, 1994). These categories are based on patient diagnoses rather than patients' reason for seeking utilization. The conclusions of both approaches have been similar---the charges for ED utilization are approximately 3 times higher than physician office visits. Baker and Baker (1994) found that in **1986** the price of an ED visit was \$143.72 compared to \$49.87 for the typical physician office visit. The charges for services at EDs and physician offices may approximate average costs of service provision, but they do not indicate MC, since they are the prices paid by paying clients. In this respect, these charges may also be misleading as to clients' costs since they occurred in a period prior to Managed Care where cost shifting prevailed.

Second, Williams (1996) has conducted the most cited and rigorous study involving the cost of ED utilization. Charges, direct costs, total costs, and marginal costs of non-urgent, semiurgent and urgent at EDs visit were estimated with monthly data, inclusive of 36 consecutive months from 1991-1993, collected from a convenience sample of six community hospitals located in the Detroit Michigan area. Both AC and MC of ED utilization of 24,010 visits were estimated with an OLS regression equation. Visits were classified by "senior coding personnel" using a criteria drawn from the Current Procedural Terminology (CPT) codes (sanctioned by the American Medical Association). The AC of a non-urgent ED visit at \$62 was 55% of the average charge of \$124; a difference Williams attributes to nonpayers and thus cost shifting. This AC is stated to be comparable to the AC of a non-urgent visit at a physician's office. The MC of non-urgent ED visits was found to be \$24, an amount considered by the author to be lower than generally assumed, but Williams provides no citations of such assumptions. Moreover, Williams does not investigate the MC of a comparable visit to a physician's office; consequently, financial cost savings through the channeling of non-urgent visits to the latter cannot be confirmed.

F2. CHAP Cost Savings Estimation

The determination of whether the implementation of CHAP generates financial cost savings by limiting ED utilization requires several interrelated assessments and considerations. First, non-urgent ED visits must be defined. Second, the number of **non-urgent** ED visits avoided must be determined because of CHAP enrollment. Third, the costs of both ED utilization and CHAP sanctioned physician visits must be calculated. Average costs (AC) and marginal costs (MC) could be employed.

Classification of Non-urgent Visits. Urgent (emergent) and non-urgent (non-emergent) ED visits by CHAP enrollees must be distinguished so the latter type of utilization can be analyzed. This effort may not be straightforward. Ideally, the reasons for ED visits should be signified not by the diagnosis of treating physician at the ED. Rather it should be determined by the CHAP enrollees' responses about why they sought medical assistance at the ED, even though they may have been diagnosed with an emergent/urgent condition.

The available CHAP survey does contain one question that asked potential participants to indicate the reason for their visit. It is unclear whether the responses occurred before or after treatment by a ED physician. This matter aside, unfortunately, the survey only asks the reason for the **last** ED visit made in the past six months before and for each six month period after entering CHAP, and not for each visit made. Obviously, the reasons for all separate visits made should be determined.

Avoided Non-urgent ED Visits. The basis of financial cost savings is the number of **avoided** non-urgent ED visits. Avoided non-urgent visits are the number of visits that an individual would have made to the care alternative would be used instead as a substitute. A seemingly accurate estimate of avoided ED visits would be the number of physician office visits after enrollment given that the number of office visits would indicate the count of medical care visits made for routine non-emergent care. Such determination assumes that enrollees' doctor visits (in the post enrollment period) were substitutes for ED visits that would have been made if the CHAP program were unavailable. Nevertheless, physician office visits could be larger in number than avoided ED visits; better access and lower costs of medical care at a primary home could impel CHAP participants to utilize medical services more often than the ED. In the CHAP survey, respondents were asked to report the number of ED visits that they made six months before and for each six months after entering the program. However, the interviewees were **not** asked the number of visits that they made to CHAP primary care home six months after enrollment.

In principle, each ED visit replaced by a primary care home visit should be ascertained according to the time of the ED visit, since the MC of ED visits at evening, peak and off-peak hours could vary substantially. However, the timing of a replaced ED visit would not be known because it would be “hindered” by CHAP participation. Thus the temporal occurrence of replaced ED visits in the enrollment period would have to be imputed on the bases of pre-enrollment ED visits designated by the timing of their occurrence. However, the CHAP data does not provide the time of day in which the ED visits took place. If CHAP enrollment did/does reduce off-peak hour ED utilization, then financial cost savings could be substantially lower (or even non-existent).

There are related matters regarding the time of ED visits, which could be a potential source of financial savings. Even with their access to a primary care home, --and the count of such medical care visits known, -- ED visits by CHAP enrollees still could have been made in the enrollment period. While non-urgent ED visits may have been reduced, some non-urgent ED utilization by CHAP enrollees may have continued, especially in the evening hours, because primary care physicians assigned by CHAP may be unavailable in the time of enrollees’ medical need. This behavior is also likely to occur with respect to uninsured individuals not enrolled in CHAP as well as insured individuals. Research on the timing of visits and reasons for the time chosen would provide insight into the design of CHAP for its effectiveness with respect to ED utilization reduction. Moreover, a similar inquiry could be conducted to determine if the time of ED visits are a more pervasive problem among CHAP and non-CHAP users and whether these two groups behave differently.

Given the limitations of the CHAP data, the number of avoided non-urgent ED visits has been determined in the following way. For those enrollees with only six months participation, avoided visits are the difference between (a) the number of non-urgent ED visits made (in the 6 months) prior to CHAP enrollment, and (b) the number of ED non-urgent visits in the 6 months after CHAP enrollment. The calculation of avoided visits for individuals enrolled for one year (i.e., two six months periods) involves two steps. First, for the first six months of enrollment, avoided visits are the difference between (a) the number of non-urgent ED visits made (in the 6 months) prior to CHAP enrollment, and (b) the number of ED non-urgent visits in the 6 months after CHAP enrollment. Second, for the second six months of enrollment, avoided visits are the difference between (a) the number of non-urgent ED visits made (in the 6 months) prior to CHAP enrollment, and (b) the number of ED non-urgent visits in the second 6 month

period after CHAP enrollment. This perspective assumes that the calculated difference is equal to the number of primary care visits made by the CHAP enrollees.

Cost Determination. Financial costs savings should be calculated as the difference between two cost figures:

- the costs of ED visits that would have been made by the CHAP enrollees as users of the EDs, and
- the costs incurred for medical services at the **enrollees' primary care home** that replaced the ED visits.

Second, costs savings would be calculated more accurately as the difference between two MC figures:

- the MC of non-urgent ED visits that would have been made by the CHAP enrollees as repeat users of the EDs for non-urgent (preventive and routine medical care) services,
- the MC incurred for medical services at the **enrollees' primary care home** that replaced the ED visits.

As described above MC analyses would provide the most accurate assessment of cost savings than AC.

However, several obstacles are encountered in the determination of MC.

- Empirical studies that provide estimates of the MC of physician visits have not been undertaken.
- The two studies of ED utilization cited above are inadequate for the MC savings estimation. The Baker and Baker (1994) study includes only the AC of physician and ED visits, and the data is not recent, encompassing 1986, and thus has limited applicability. The Williams Study (1996) does not include estimates of physician visits, but does for ED utilization. However, these estimates are for EDs in Michigan hospitals and uses older data covering 1991 through 1993.
- A search of data sources of various health organizations (e.g., American Hospital Association) has been conducted to obtain figures and estimates. None of these organizations provide MC estimates of either physician office visits or ED visits for the current or past periods.

- Data available from health organizations do not permit the statistical estimation of the MC of either physician office or ED visits.

F3. AC Estimates

Estimation of financial cost savings has been conducted on the basis of AC. Several data sources from health organizations were available for the average costs of physician visits. There is one data source for the approximation of the AC of ED visits. The data sources are provided in Table 2.

**TABLE 2
LIST OF DATA SOURCES FOR AC SAVINGS ESTIMATION**

Agency for Healthcare Research and Quality (AHRQ), Center for Cost and Financing Studies, 2002, <i>1999 Emergency Room Visits, Medical Expenditure Survey, MEPS H33E, Rockville MD.</i>
American Medical Association, 1999, <i>Socioeconomic Characteristics of Medical Practice 1997/98</i> , ed. Martin L. Gonzalez and Puling Yang. Center for Health Policy Research.
American Medical Association, 2002, <i>Physician Socioeconomic Statistics 2000-2002 edition</i> , ed. John D. Wassenaar and Sara L. Thran. Center for Health Policy Research.
American Medical Association, 2002, <i>Physician Characteristics and Distribution in the US 2002-2003 edition</i> , ed. Thomas Pasko and Bradley Seidman.
Center for Medicaid and Medicare Services, 2002, <i>Physician Fee Schedule Payment Amount File.</i>
Delaware Healthcare Association, 2002, <i>Delaware Acute Hospital Utilization Highlights</i> , http://www.deha.org/ .
Linda F. McCraig and Nghi Ly U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics, 2002, <i>National Hospital Ambulatory Medical Care Survey: 2000 Emergency Department Summary. Washington, D.C.</i>
U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics, 2002, <i>Health, United States, 2002. Washington, D.C.</i>
Yale Wasserman, 2002, <i>Physicians' Fee Reference 2002, 19th ed.</i> Medical Publishers, Ltd. Milwaukee WS

AC of ED Visit. The estimates of the average costs of ED visits were obtained from data contained in *1999 Emergency Room Visits*, which is part of the Medical Expenditure Panel Survey (MEPS) conducted periodically by the Federal Agency for Health Research and Quality (AHRQ). The figures are national estimates based on a random sample of ED visits across the country. As shown on Table 3, data is given for 1999 through 2002, but actual data was available for only 1999. The figures for the other years were extrapolated on the basis of increases that would have occurred according to the Consumer Price Index for

outpatient hospital services (7.2% 1999 to 2000; 6.6% for 2000 to 2001, and an assumed 6.6% for 2001 to 2002 since 2002 figures have not been published). Three categories of visits are presented: (a) all types of emergency department visits, (b) emergency visits, and (c) non-urgent visits, using the MEPS definition of emergency. For each type of visit, financial allocations are shown separately for expenditures and charges. For each one, three categories are presented: facility, doctor, and the total that is the sum of doctor and facility items. Charges are not employed in the cost savings analysis because they indicate the amount billed but not paid for service, and entail discounting for services and possibly shifting of costs. Expenditures are the sum of payments received for each emergency department visits, including Medicaid, Medicare, public insurance, payments by private insurance, and out of pocket payments. While expenditures do not strictly represent the value of resources used to produce services (i.e., costs), they do measure the monetary value allocated for service provision (Monheit, 1999), and thus are the closest approximations of costs that are available.

**TABLE 3
AVERAGE EXPENDITURE AND CHARGE OF AN ED VISIT: MEPS DATA**

	A. All Types of Visits			
	1999	2000	2001	2002
Total Expenditure	\$385.00	\$412.72	\$439.96	\$469.00
Total Facility Expenditure	\$297.00	\$318.38	\$339.40	\$361.80
Total Doctor Expenditure	\$88.00	\$94.34	\$100.56	\$107.20
Total Charge	\$741.00	\$794.35	\$846.78	\$902.67
Total Facility Charge	\$566.00	\$606.75	\$646.80	\$689.49
Total Doctor Charge	\$173.00	\$185.46	\$197.70	\$210.74
	B. Emergency (Accident/Injury Visits)			
Total Expenditure	\$431.00	\$462.03	\$492.53	\$525.03
Total Facility Expenditure	\$326.00	\$349.47	\$372.54	\$397.12
Total Doctor Expenditure	\$105.00	\$112.56	\$119.99	\$127.91
Total Charge	\$813.00	\$871.54	\$929.06	\$990.38
Total Facility Charge	\$617.00	\$661.42	\$705.08	\$751.61
Total Doctor Charge	\$196.00	\$210.11	\$223.08	\$238.76
	C. Non-Urgent Visits^a			
Total Expenditure	\$343.00	\$367.70	\$391.96	\$417.83
Total Facility Expenditure	\$271.00	\$290.51	\$309.69	\$330.13
Total Doctor Expenditure	\$78.00	\$83.62	\$89.13	\$95.02
Total Charge	\$676.00	\$724.67	\$772.50	\$823.49
Total Facility Charge	\$521.00	\$558.51	\$595.37	\$634.67
Total Doctor Charge	\$154.00	\$165.09	\$175.98	\$187.60

Source: Agency for Healthcare Research and Quality (AHRQ),
Center for Cost and Financing Studies 2002, 1999 Emergency
Room Visits, Medical Expenditure Survey, MEPS H33E, Rockville, MD

^aIncludes visits for diagnoses and treatment, maternity care, mental health, and follow-up care.

AC of Physician Visits. On Table 4, three dimensions of the average cost of physician visits in 2002 are presented. First, Delaware figures are given, and two sets of national figures are provided. The sources of these figures are cited on the bottom of the table. Each set of figures is shown according to CPT (Current Procedural Terminology) codes in column 1 that define various activity levels based on the properties of services rendered. The definitions of these codes are given in Table 5. All figures represent recommended fees for different services provided under Medicare, which is the major guiding force for the pricing of health care services. In column 6, the fees are taken from the *Physicians' Fees Reference 2002* that is sanctioned by the American Medical Association. The figures in columns 2 through 5 are fees stipulated by the Center for Medicare and Medicaid Services (formerly Health Care Financing Agency, HCFA) that regulates physician payments for the two named programs. The fees are displayed for new patients and established patients of physicians with considerably higher prices charged for the former compared to the latter for similar service levels. For Delaware and the national CMS estimates, fees are also specified for services rendered by practitioners in facility and non-facility sites. A facility is where a physician is part of an organizational practice that has the burden of the costs of the staff, supplies and equipment. A non-facility is where the physician must bear costs of the staff, supplies and equipment. Thus fees applicable to a physician in a non-facility site are higher.

**TABLE 4
AVERAGE PHYSICIAN FEES IN 2002**

CPT Codes	New Patient				
	Delaware ¹		National ¹		National ²
	A (\$)	B (\$)	A (\$)	B (\$)	Physician (\$)
99201	34.72	23.11			34.03
99202	62.60	46.11	63.84	48.21	61.54
99203	93.45	70.22	95.26	73.46	91.95
99204	132.93	104.08	136.96	108.65	130.68
99205	169.02	138.30	174.46	143.47	166.15
Established Patient					
	Delaware ¹		National ¹		National ²
	A (\$)	B (\$)	A (\$)	B (\$)	Physician (\$)
	99211	20.77	8.78	21.04	9.18
99212	36.97	23.48	37.49	24.49	36.20
99213	51.34	34.48	82.64	58.92	50.32
99214	80.54	56.97	121.28	95.26	78.91

A is non facility setting

B Facility setting

NA is not applicable

¹Center for Medicare and Medicaid Services, 2002.

Annual Physician Fee Schedule Payment Amount File. Calendar year 2002./

²Yale Wasserman, 2002. *Physicians' Fee Reference 2002, 19th ed.*

Medical Publishers, Ltd., Milwaukee, WS

The Delaware figures have been chosen for physician fee cost estimation. Both facility and non-facility fees are employed because the affiliation of participating physicians for CHAP participants is not known. The first visit to a physician by a participant will be measured as a new patient visit, and the second and higher number of visits will be considered as established patient visits. A final determination is the appropriate service level (CPT) code to employ. The choice was based on a review of the reasons for the last ED visits by CHAP participants obtained from the CHAP survey. The reasons indicate that the types of illnesses could require service levels encompassed by either the 99203 and 99204 CPT codes for new patients and the 99213 and 99214 CPT codes for established patients. The 99203 and 99213, and 99204 and 99214 represent respectively treatment of problems with low to moderate severity and, treatment of problems with moderate to high severity. Estimates will be given for both types of treatment problems.

**TABLE 5
DEFINITION OF PHYSICIAN'S SERVICES BY CPT CODES**

New Patient	
99201	Office or other outpatient visit for the evaluation and management of a new patient, which requires these three key components: a problem focused history; a problem focused examination; and straightforward medical decision making. Counseling and/or coordination of care with other providers or agencies are provided consistent with the nature of the problem(s) and the patient's and/or family's needs. Usually, the presenting problems are self limited or minor. Physicians typically spend 10 minutes face-to-face with the patient and/or family.
99202	Office or other outpatient visit for the evaluation and management of a new patient, which requires these three key components: an expanded problem focused history; an expanded problem focused examination; and straightforward medical decision making. Counseling and/or coordination of care with other providers or agencies are provided consistent with the nature of the problem(s) and the patient's and/or family's needs. Usually, the presenting problems(s) are of low to moderate severity. Physicians typically spend 20 minutes face-to-face with the patient and/or family.
99203	Office or other outpatient visit for the evaluation and management of a new patient, which requires these three key components: a detailed history; a detailed examination; and medical decision making of low complexity. Counseling and/or coordination of care with other providers or agencies are provided consistent with the nature of the problems(s) and the patient's and/or family's needs. Usually, the presenting problems(s) are of moderate severity. Physicians typically spend 30 minutes face-to-face with the patient and/or family.
99204	Office or other outpatient visit for the evaluation and management of a new patient, which requires these three key components: a comprehensive history; a comprehensive examination; and medical decision making of moderate complexity. Counseling and/or coordination of care with other providers or agencies are provided consistent with the nature of the problem(s) and the patient's and/or family's needs. Usually, the presenting problem(s) are of moderate to high severity. Physicians typically spend 45 minutes face-to-face with the patient and/or family.

New Patient cont.	
99205	Office or other outpatient visit for the evaluation and management of a new patient, which requires these three key components: a comprehensive history; a comprehensive examination; and medical decision making of high complexity. Counseling and/or coordination of care with other providers or agencies are provided consistent with the nature of the problem(s) and the patient's and/or family's needs. Usually, the presenting problem(s) are of moderate to high severity. Physicians typically spend 60 minutes face-to-face with the patient and/or family.
Established Patient	
99211	Office or other outpatient visit for the evaluation and management of an established patient, that may not require the presence of a physician. Usually, the presenting problem(s) are minimal. Typically, 5 minutes are spent performing or supervising these services.
99212	Office or other outpatient visit for the evaluation and management of an established patient, which requires at least two of these three key components: a problem focused history; a problem focused examination; straightforward medical decision making. Counseling and/or coordination of care with other providers or agencies are provided consistent with the nature of the problem(s) and the patient's and/or family's needs. Usually, the presenting problem(s) are self limited or minor. Physicians typically spend 10 minutes face-to-face with the patient and/or family.
99213	Office or other outpatient visit for the evaluation and management of an established patient, which requires at least two of these three key components: an expanded problem focused history; an expanded problem focused examination; medical decision making of low complexity. Counseling and coordination of care with other providers or agencies are provided consistent with the nature of the problem(s) and the patient's and/or family's needs. Usually, the presenting problems(s) are of low to moderate severity. Physicians typically spend 15 minutes face-to-face with the patient and/or family.
99214	Office or other outpatient visit for the evaluation and management of an established patient, which requires at least two of these three key components: a detailed history; a detailed examination; medical decision making of moderate complexity. Counseling and/or coordination of care with other providers or agencies are provided consistent with the nature of the problems(s) and the patient's and/or family's needs. Usually, the presenting problem(s) are of moderate to high severity. Physicians typically spend 25 minutes face-to-face with the patient and/or family.
Emergency Department Services	
New or Established Patient	
99281	Emergency department visit for the evaluation and management of a patient, which requires these three key components: a problem focused history; a problem focused examination; and straightforward medical decision making. Counseling and/or coordination of care with other providers or agencies are provided consistent with the nature of the problem(s) and the patient's and/or family's needs. Usually, the presenting problem(s) are self limited or minor.
99282	Emergency department visit for the evaluation and management of a patient, which requires these three key components: an expanded problem focused history; an expanded problem focused examination; and medical decision making of low complexity. Counseling and/or coordination of care with other providers or agencies are provided consistent with the nature of the problem(s) and the patient's and/or family's needs. Usually, the presenting problem(s) are of low to moderate severity.
99283	Emergency department visit for the evaluation and management of a patient, which requires these three key components: an expanded problem focused history; an expanded problem focused examination; and medical decision making of moderate complexity. Counseling and/or coordination of care with other providers or agencies are provided consistent with the nature of the problems(s) and the patient's and/or family's needs. Usually, the presenting problem(s) are of moderate severity.

New or Established Patient cont.	
99284	Emergency department visit for the evaluation and management of a patient, which requires these three key components: a detailed history; a detailed examination; and medical decision making of moderate complexity. Counseling and/or coordination of care with other providers or agencies are provided consistent with the nature of the problem(s) and the patient's and/or family's needs. Usually, the presenting problem(s) are of high severity, and require urgent evaluation by the physician but do not pose an immediate significant threat to life or physiologic function.
99285	Emergency department visit for the evaluation and management of a patient, which requires these three key components within the constraints imposed by the urgency of the patient's clinical condition and/or mental status; a comprehensive history; a comprehensive examination; and medical decision making of high complexity. Counseling and/or coordination of care with other providers or agencies are provided consistent with the nature of the problem(s) and the patient's and/or family's needs. Usually, the presenting problem(s) are of high severity and pose an immediate significant threat to life or physiologic function.

Source: Yale Wasserman, 2002, Physicians' Fee Reference 2002, 19th ed. Medical Publishers, Ltd. Milwaukee, WS.

Utilization and AC Estimates. Table 6 provides an aggregate overview of 795 CHAP enrollees who have participated in the program for at least six months and up to a year in the first year of the program. Only 10.7% of the participants (86 of 795) had visited an ED for care six months before enrollment. Of the 86 who had used the ED, 75 of them had one visit and 11 had two or more visits. Thus ED utilization by CHAP enrollees was very small prior to program participation. For the first year (two six-month periods) during their enrollment, ED visits by the participants declined from the initial small amount of 86 to 32 (4.0%) individuals having one or more visits with only 10 enrollees having a maximum of 3 visits.

**TABLE 6
CHAP ENROLLEES BY NUMBER OF ED VISITS**

ED Visits	Before CHAPS		After CHAPS	
	Number	Percent	Number	Percent
0	709	89.20	763	96.0
1	75	9.40	22	2.8
2	7	0.90	9	1.1
3	2	0.25	1	0.13
4	1	0.13	0	0.0
7	1	0.13	0	0.0
Total	795	100	795	100

Source: CHAP Baseline and Follow-up Surveys

The figures on Table 6 do not designate how much individual ED users in the pre-enrollment period did actually decrease their utilization in the two six month periods after enrollment. Table 7 presents the ED utilization of CHAP enrollees cross-classified by the number of ED visits before and after enrollment. In columns one and two, the number of CHAP enrollees are classified according to the number of ED visits six months before enrollment. Columns of 3 through 6 show the number of visits that

enrollees had after enrollment compared to their pre-enrollment quantity of ED visits. The reduced number of ED visits between the two periods is presented in column 7, and the number of ED visits increased from the pre and post enrollment periods is given in column 8.

**TABLE 7
COMPARISON OF ED VISITS BY CHAP PARTICIPANTS BEFORE AND AFTER ENROLLMENT**

ED Use 6 Months Before Chaps		No. of Enrollees by ED Use 6 Months after CHAPS				Pre-CHAP Visits	Post-CHAP Visits	Visits Reduced	Visits Increased
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
No. of Visits	No. of Enrollees	0	1	2	3	0			
0	709	693	12	3	1	0	21	0	21
1	75	63	8	4	0	75	16	59	4
2	7	5	1	1	0	14	3	11	0
3	2	1	1	0	0	6	1	5	0
4	1	1	0	0	0	4	0	4	0
7	1	0	0	1	0	7	2	5	0
Total	795	763	22	9	1	107	43	84	25

Column numbers are signified by parentheses
Source: CHAP Baseline and Follow-up Surveys

A brief description will illustrate how reduced visits, column 7, were obtained. Of the 709 participants who did not use the ED in the pre-enrollment period, 12 individuals had one visit, 3 individuals had made two visits, and one had 3 visits after enrollment. That is, 16 people who had not utilized the ED before enrollment actually increased their usage of ED services to a total of 21 (see column 8). $[(12 \times 1) + (3 \times 2) + (3 \times 1)]$. In the pre-enrollment period, 75 people had one visit. After enrollment 63 of them did not use the ED and thus 63 visits were saved, but 8 individuals used the ED for one visit that resulted in no increase or decrease in visits, and 4 individuals used the ED twice for a net total of 4 increased visits $[4 \times 2 = 8$ after CHAP visits less 4 (individuals with one) pre-CHAP visits]. The total number of reduced visits for this first year cohort was 84 visits; but there was also an increase of 25 visits.

The various estimates of the AC savings are presented on Table 8. The estimates are presented for the “gross” financial savings of 84 reduced visits, and for the “net” savings for 59 visits that is determined by subtracting the increased visits (25 in Table 7) from the reduced visits. Irrespective of the CPT Codes used, the total cost estimates do not vary much. The estimates of “gross” savings range from a low of \$24,507.89 to a high of \$29,592.38. The estimates of “net” savings vary between \$14,062.14 and \$19,146.63. These annual amounts of **total** savings by CHAP are due simply to the limited number of CHAP enrollees who had utilized the ED before and after enrolment in the program. However, cost savings per visit are considerable, with an approximate range of \$300 to \$380.

**TABLE 8
AVERAGE COST SAVINGS FROM REDUCED ED VISITS**

	Facility and CPT Codes 99203 and 99213		
	Cost/Visit ^a	No. of Visits ^b	Total Cost ^c
1. All ED Visits Reduced	\$417.83	84	\$35,097.72
2. First Physician Visit—New Patient (99203)	\$70.22	73	\$5,126.06
3. Subsequent Physician Visits—Established Patient (99213)	\$34.48	11	\$379.28
4. Total Cost of Physician Visits (2+3)	--	--	\$5,505.34
5. Total Costs Savings (1-4)	--	--	\$29,592.38
6. Less All ED Visits Increased	\$417.83	25	\$10,445.75
7. Net Cost Saving (6-5)	--	--	\$19,146.63

Average Cost Savings—New Patient (99203)

Average Cost Saving—Established Patient (99213)

	Non-Facility and CPT Codes 99203 and 99213		
	Cost/Visit ^a	No. of Visits ^b	Total Cost ^c
1. All ED Visits Reduced	\$417.83	84	\$35,097.72
2. First Physician Visit—New Patient (99203)	\$93.45	73	\$6,821.85
3. Subsequent Physician Visits—Established Patient (99213)	\$51.34	11	\$564.74
4. Total Cost of Physician Visits (2+3)	--	--	\$7,386.59
5. Total Costs Savings (1-4)	--	--	\$27,711.13
6. Less All ED Visits Increased	\$417.83	25	\$10,445.75
7. Net Cost Saving (6-5)	--	--	\$17,265.38

Average Cost Savings—New Patient (99203)

Average Cost Saving—Established Patient (99213)

	Facility and CPT Codes 99204 and 99214		
	Cost/Visit ^a	No. of Visits ^b	Total Cost ^c
1. All ED Visits Reduced	\$417.83	84	\$35,097.72
2. First Physician Visit—New Patient (99204)	\$104.08	73	\$7,597.84
3. Subsequent Physician Visits—Established Patient (99214)	\$56.97	11	\$626.67
4. Total Cost of Physician Visits (2+3)	--	--	\$8,224.51
5. Total Costs Savings (1-4)	--	--	\$26,873.21
6. Less All ED Visits Increased	\$417.83	25	\$10,445.75
7. Net Cost Saving (6-5)	--	--	\$16,427.46

Average Cost Savings—New Patient (99204)

Average Cost Saving—Established Patient (99214)

	Non-Facility and CPT Codes 99204 and 99214		
	Cost/Visit ^a	No. of Visits ^b	Total Cost ^c
1. All ED Visits Reduced	\$417.83	84	\$35,097.72
2. First Physician Visit—New Patient (99204)	\$132.93	73	\$9,703.89
3. Subsequent Physician Visits—Established Patient (99214)	\$80.54	11	\$885.94
4. Total Cost of Physician Visits (2+3)	--	--	\$10,589.83
5. Total Costs Savings (1-4)	--	--	\$24,507.89
6. Less All ED Visits Increased	\$417.83	25	\$10,445.75
7. Net Cost Saving (6-5)	--	--	\$14,062.14

Average Cost Savings—New Patient (99204)

Average Cost Saving—Established Patient (99214)

Sources: ^a MFPS Expenditures on Table 3

^b Table 7

^c Total Cost=cost/visit x no. of visits

However, several caveats are in order. One, the utilization includes only figures for participation in CHAP for one year. Two, **despite the fact that AC is not as accurate as MC for estimating savings, the difference in the magnitude of the AC of ED visits and physician visits do indicate that financial savings per visit could be considerable, if ED non-urgent visits were reduced.** It must be recognized, as shown by a comparison of Table 3 (AVERAGE EXPENDITURE AND CHARGE OF AN ED VISIT) and Table 4 (AVERAGE PHYSICIAN FEES IN 2002), that when only physician costs are considered, the costs of medical services for problems with moderate severity are lower in physician offices than in EDs. Only for services applied to problems with moderate to high severity are physician office visits slightly higher than ED doctor expenditures. However, when total costs are considered, there is substantial differences in the AC of care; the AC of ED services are higher than direct primary care for an individual patient. Moreover, this substantial difference is due to the fact that a large portion of the costs of an ED visit is for facilities expenditures (75%) and that doctor expenditures of an ED visit is approximately 25% of the total cost. There are two important implications. Care provided in the ED and physician offices for the same illness may not be comparable with more services rendered in the ED that is reflected by its higher costs. A public policy question is whether these additional services are necessary. In addition, a large amount of resources paid for ED services are allocated for the provision of infrastructure, and for their non-emergency services ED users pay a considerable sum of these fixed costs. If ED utilization were reduced in Delaware via CHAP, the marginal costs of ED operations would be cut in the short run, and thereby would reduce the total resources allocated to health care in the State. Also in the short run, the overhead costs (of the already provided infrastructure) of EDs would be reallocated to the remaining ED users, which would result in higher bills for services. In the long run, however, fixed costs would decline if the reduced number of users could be accommodated with less equipment and fewer contractual staff that were put in place to adjust to the “new” demand for fewer services.

G. ALTERNATIVE SOURCES OF CARE

What follows are very brief considerations of sources of medical care that have been suggested as alternatives to EDs for non-emergency services. These health care options would be worth investigating empirically in the future because of their potential for achieving financial savings in medical care. As the

discussion indicates, however, although ED utilization could be reduced, these options may not be congruent with the CHAP objective of providing continuity of primary care to low income adults.

G1. Increased Physician Access

A very common suggestion for mitigating the overcrowding of EDs due to non-emergency care is the extension of office hours of primary care physicians. This solution has been offered because research has determined that much non-urgent ED utilization occurs in the evening. Some health plans have rewarded doctors for night and weekend hours (amednews.com, Feb 12, 2001, Weinick, et al., 2000, 2001). Health insurance companies would consider this approach to be applicable to EDs of Delaware, if their total ED payments for visits by their clients would be reduced by an amount that is greater than the financial costs required to extend physician office hours. We do not have any indication that such an analysis has been undertaken by Delaware health plans. This approach would have more direct applicability to **insured** individuals who are ED users and cannot obtain non-urgent care during the daytime due to work or other social and family requirements. It would not be useful for non-insured individuals who, due to income limits, are ineligible for CHAP (or Medicaid) because they are unlikely to have a “regular” source of primary care.

The benefits of extended physician office hours could spillover to individuals eligible for CHAP. This “free” piggyback benefit would occur **only if these eligible individuals enrolled as CHAP participants** and, if doctors within CHAP would be the medical practices financed for extended hours. Unfortunately, the CHAP survey does not provide information on the time of ED visits by potentially eligible CHAP enrollees so assessment of the potential gain is difficult to estimate.

G2. Fast Tracking

Fast tracking entails establishing an urgent center adjacent to the ED to which individuals with non-urgent minor illness and injuries are diverted for medical care. The care would be provided sooner to the individuals than they would receive through the waiting at the ED. Patients who have been treated through fast tracking have shorter length of hospital stays, fewer medical tests applied, lower average charges for services, and better health outcomes and levels of satisfaction in comparison to ED users (Councilman, 2000; Hampers, 1999; Simon, 1996; Simon, 1997). There are some issues that must be considered, however (Weinick, et al., 2001). First, fast tracking does not change patient incentives to seek

medical care outside of traditional venues i.e., primary care sources. Second and correlatively, fast tracking is not a mechanism through which the continuity of primary care could be provided. Third, CHAP enrollees may or may not be affected by the availability of fast tracking, if hours of available service are a concern. Putting aside the issue of primary care, fast tracking as a means to providing needed non-emergency medical care when a physician is unavailable could be compared to either CHAP, or continued emergency department utilization, or both. One would have to compare the (a) additional incremental (marginal) costs, of putting in place the fast track facility --inclusive of building or renting of space, equipment purchase, and staffing which would be overhead or fixed costs, and the variable costs for the expected number of treated --, (b) the (marginal) cost savings of reducing non-emergency ED utilization, and the (c) (marginal) costs of implementing the CHAP program inclusive of financial savings from ED utilization reduction. All these dimensions would require the determination of the number of likely participants in each option.

G3. Increased Access to Urgent Centers and Community Healthcare Facilities

In principle, this increased access could be accomplished in two ways. First, the hours of existing centers and facilities could be extended through the financing of a governmental subsidy. Second, additional centers, with extended hours, could be established in order to have a healthcare access more geographical distributed throughout the State. The same issues prevail with this option as with extended physician office hours. Both insured and uninsured individuals would have access to medical care at times when physician offices are not typically open; such availability could decrease the crowding, and thus waiting time, at emergency departments. Two outcomes could be expected with the extension of facility hours and providing new urgent centers. One, the availability of additional hours could encourage additional utilization of the centers by CHAP and non-CHAP eligible individuals. Two, the objective of the continuity of primary care for uninsured individuals including those individuals eligible for CHAP would not be achieved. The financial evaluation of extended access, as source of non-emergency medical care, would entail an analysis similar to fast tracking. The costs of the governmental subsidy would be compared with the (a) the (marginal) cost savings of reducing non-emergency ED utilization, and the (b) (marginal) costs of implementing the CHAP program inclusive of financial savings from ED utilization reduction.

G4. Reconfiguration of the ED as Primary Care Unit

This option is related to Fast Tracking. EDs could be transformed into a facility that provides both urgent medical care and primary care practices (ACEP, 2001). As with Fast Tracking, the reconfiguration draws upon the argument of economies of scope. That is, because of common (and overlapping) resources with its parent hospital (buildings, staff, personnel skills, and equipment), an ED could provide medical services for both urgent care and primary care that would produce economies (a reduction in financial costs) of both types of care. Such joint provision, it is argued, would result in lower costs of primary care in the new ED configuration than would be incurred in private physician office. This position is an empirical question. If such reconfiguration would have as its objective the provision of primary care for the CHAP targeted population (low-income uninsured), it would be in effect a substitute health insurance program in which hospitals would become MCOs with particular sites. The determination of the feasibility of ED primary care option would require a comparison of the operating costs of the CHAP program with the additional (marginal) costs that would be incurred for the expansion of the ED for the CHAP targeted group. The ED costs would include not only the variable costs of ED physician visits but also the new fixed (mostly capital) costs to establish the ED as a primary care unit. Putting aside any administrative and legal issues, the cost comparison should take into account the transaction costs differential of the two approaches. Specifically, given that EDs have fixed locations, patients could incur substantial differences in transportation and time costs in their utilization of ED primary care units compared to services received at the offices of participating CHAP physicians. Moreover, travel distances for patients could be a significant obstacle to seeking primary routine care.

G5. Expansion of DHCP

The Delaware Health Childrens Program (DHCP) could be expanded to provide health insurance coverage for low-income uninsured individuals who are the CHAP targeted population. As the federal-state jointly financed SCHIP (through a matching federal grant), State Children Health Insurance Program, the extension of coverage would require a waiver for the U.S. Department of Health and Human Services (HHS). Several states – Arizona, California, Illinois, and Michigan– have been given such waivers and extended coverage to (adult) parents or guardians of children who are eligible for SCHIP enrollment. In these states, eligibility encompasses households with income that range from 101% of the FPL to 200% of

the FPL. One state, New Mexico, has received a waiver to extend coverage to adults with and without children (and no private insurance) and whose income falls between 101% and 200% of the FPL.

If a waiver were obtained for adults with income limits consistent with CHAP objectives, the State of Delaware would incur an additional budgetary outlay for each new enrollee for whom a capitation payment is made to a participating Managed Care Organization as well as some additional administrative costs. The capitation costs would be offset partially by the premiums paid by enrollees. Previous research indicates that the currently applicable three classes of premiums could be increased above existing levels with only a loss of very small number of participants (Solano and McDuffie, 2000). Two immediate concerns must be raised. One, the DHCP is currently encountering difficulties regarding MCO participation. Only one MCO is presently providing services, and the federal government requires at least two MCOs to ensure choice of physicians by clients. Two, eligibility for SCHIP participation by CHAP enrollees may be limited. In the first year of operation, approximately 80% of CHAP enrollees are not U.S. citizens, a class of individuals who are ineligible for enrollment in any SCHIP. In this respect, the important policy question is: Is there sufficient number of individuals among existing enrollees and potential CHAP enrollees to warrant their inclusion into DHCP?

III. INPATIENT HOSPITAL ADMISSION ANALYSIS

A. COST SAVINGS PERSPECTIVE

The determination of whether CHAP generates financial cost savings by reducing hospitalization entails two considerations. First, the number of hospitalizations avoided due to CHAP participation must be determined. Second, the costs of the avoided hospitalizations must be calculated. In principle, average costs (AC) and marginal costs (MC) could be employed. However, because of the lack of appropriate data and the small number of avoided hospitalizations, only AC estimates are given. Nevertheless, for purposes of showing the requirements for future research, we present the MC methodology that could be applied if appropriate data were available. The AC estimates are based not only on the number of avoided hospital admissions by CHAP enrollees but also on an assumption about the length of stay (LOS) of hospitalizations. Estimation encompasses CHAP participants who have been enrolled for at least six-month period and up to a year in the first year of the program.

A1. Avoidable Hospitalizations

Avoidable hospitalizations are the number of hospital stays that an individual would have had, but did not take place because primary care has been provided through CHAP. This determination requires the recognition of several conceptual and empirical limitations. First, avoidable hospitalization should include only those illnesses that medical treatment provided by CHAP could mitigate or prevent to that a patient would not require intensive or acute medical care. Hence, hospital admission for accidents, as well as the hospitalization for childbirth should not be counted. Second, knowledge is limited about (a) the etiology of many illnesses, (b) the temporal connection between the progression of illness and required hospitalization, and (c) the effects of medical intervention on patient health conditions that could require or inhibit a hospital stay. Third and concomitantly, the time frame of this CHAP analysis may be inadequate for the assessment of the reduction in some hospitalizations. For some CHAP individuals, medical care interventions may be provided “too late” in the course of their illnesses to prevent a hospital stay. Likewise, some illnesses may be managed medically so as to put off required hospitalization into future years (which would not be captured by the present data set). Or, more generally, medical intervention by CHAP primary care physicians are likely to involve health effects that would be manifested only in the long term, which could influence the need to for the hospitalization of an individual. (See Dr. James Gill’s first report on health issues entailed in CHAP for a more complete explanation of these limitations).

Given the above limitations, the number of avoidable hospitalizations has been determined in the following way. Avoidable visits are the difference between (a) the number of hospitalizations (in the 6 months) prior to CHAP enrollment, and (b) the number of hospitalizations in the 6 months to a year after CHAP enrollment. This perspective assumes that the calculated difference is directly attributable to primary care obtained by the CHAP enrollees.

A2. Hospital Admissions

The extent of hospitalizations of the 795 CHAP participants before and after program enrollment is presented on Table 9. The data show hospitalization according to the number of stays. In the pre-enrollment period, 29 people were hospitalized in the six months preceding enrollment with only three participants admitted more than once. With consideration of these multiple admission, the total number of hospitalization was 33. The number of hospitalizations dropped only slightly to 30 hospitalizations with 25 enrollees hospitalized during the enrollment period covering one year. If only the first six months of

enrollment were considered then hospitalization would have declined to 24 since in the second six months of enrollment only one individual was admitted once.

**TABLE 9
HOSPITALIZATIONS**

Hospital Stays	Before CHAP			After CHAP		
	Enrollees	Hospitalization		Enrollees	Hospitalization	
		All	Adjusted		All	Adjusted
0	776	0	0	770	0	0
1	26	26	16	21	21	10
2	2	4	4	3	6	6
3	1	3	3	1	3	3
Total	795	34	23	795	30	19

Table 10 presents the reasons for hospitalizations. Because the CHAP survey only asked the reason for a person’s last hospital stay, the number of admissions is 30 (and not 34 as given in the above table) in the pre-enrollment period and 25 (and not 30 as given in Table 9) in the CHAP enrollment period. The hospitalizations for auto accidents and child birth/pregnancy were dropped for the cost savings calculations. The number of hospitalizations after these adjustments is given on Table 9 in the columns “Adjusted Hospitalizations”. Consequently, the number of avoidable hospitalizations for the calculation of the AC financial savings estimates is merely 4, a small number not unexpected given the limitations cited above.

**TABLE 10
REASONS FOR HOSPITALIZATION**

Reason	Before Enrollment	After Enrollment
Auto Accident	2	1
Non Auto Injury/Accident	3	0
Child Birth/Pregnancy	6	10
Heart/Kidney/Stomach	3	3
Surgery	7	3
Seizures	0	2
Other	9	6
Total	30	25

An additional factor to consider in the cost savings evaluation is the length of stay (LOS) of the avoidable hospitalizations. (LOS is measured as total inpatient days divided by total discharges). LOS, which has been declining over the past decades, varies by type of illness and age. Unfortunately, data on LOS by CHAP respondents was incomplete, with substantial missing data. Thus the cost savings estimates are calculated on the basis of the average length of stay for all types of hospital admissions. The average

LOS for Delaware hospitals is shown in Table 11. The data indicate a slight increase in the LOS in the last three years, which would be expected to produce a rise in the cost of hospitalization.

TABLE 11
REASONS FOR HOSPITALIZATION
Average Length of Stay (LOS) in Delaware Acute Care Hospitals

Year	LOS in Days				
	1997	1998	1999	2000	2001
LOS	4.97	4.83	5.03	5.2	5.3

Source: Delaware Healthcare Association, Delaware Acute Care Hospitals, Utilization Highlights

A3. AC Determination

AC savings have been estimated with MEDPAR data that is compiled by the Center for Medicare and Medicaid Services. An AC estimate is shown for the year 2000 on Table 12. The data encompasses discharges, days of services, and financial charges for short stay inpatient hospitals of each state. The table provides a comparison of Delaware with national figures as well as the surrounding states of New Jersey and Pennsylvania. For Delaware, the average LOS is 6.6 days that entails a charge of \$12,626. (If LOS on Table 11 were employed the 5.2 LOS would “cost” \$9,948 = 5.2 * \$1,913). As shown in the last column, the AC savings for the 4 avoidable hospitalizations attributable to CHAP is \$50,506, a small amount that due to the few, 4 avoidable hospital admissions. In addition, the AC savings is \$1,913 per inpatient day avoidable, a figure that could be employed to determine an AC savings estimates when the number of avoidable hospitalizations changed in the future (adjusted for price increases in medical care).

TABLE 12
AC ESTIMATE OF AVOIDABLE HOSPITALIZATIONS

	LOS ^a	Cost per LOS ^b	Cost per Day ^c	Avoidable Hospitalizations (AH)	AC Savings of AH
National	6.0	\$16,162	\$2,693	4	\$64,648
New Jersey	7.5	\$27,544	\$3,673	n/a	n/a
Pennsylvania	6.2	\$18,267	\$2,946	n/a	n/a
Delaware	6.6	\$12,626	\$1,913	4	\$50,504

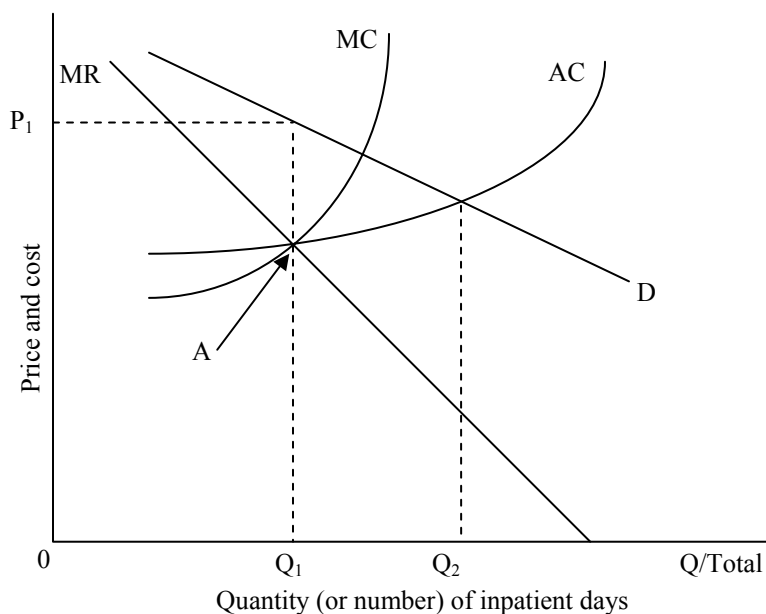
^aLOS=Inpatient days/total number of discharge

^bCost per LOS=(charge/inpatient days)*LOS

^cCost per day=charges/inpatient days

Source: Center for Medicare and Medicaid Services, MEDPAR Inpatient Hospital Fiscal Year 2000 (6/01 Update), Short Stay Inpatient by State for National DRG.

FIGURE 2
PRICE AND OUTPUT POLICIES OF A PROFIT-MAKING HOSPITAL.



There are two issues concerning the applicability and utility of the AC estimates for CHAP. The AC estimates may be fairly representative of Delaware hospitals despite differences in their size. The AC of hospitalization may not vary considerably. The summary of the empirical evidence on economies of scale of hospital confirms that the AC of inpatient stays is lowest among hospitals with 200 to 300 beds; but the AC does not fall sharply over the size of hospitals and there is very little differences between very large and small hospitals (Feldstein, 1998). With AC estimation, savings determination does not consider which hospital the CHAP enrollees would have been admitted.

A second observation can be made about the aggregate AC measurement, putting aside the variability of AC among hospitals. The AC savings may be equivalent to the true or actual financial cost savings that are (and can be) realized. As monopolistic competitors within the State of Delaware, if the hospitals are profit maximizers (with profits defined as gains for the community for non-profit hospitals), then the MC savings of avoidable hospitalizations would be virtually identical to AC savings. This conclusion is drawn from the economic theory and the empirical evidence with respect to cost and revenue behavior of hospitals, as demonstrated by Figure 2. A hospital's most profitable position is at point A, i.e., the most revenue gain relative to cost incurred for services. At Point A, the MC for inpatient service days

(the output of hospitals) would equal the marginal revenue (MR) obtained from inpatient service days so that beyond Q_1 the revenue gained for additional patient days would be less than the cost incurred for their provision. It is at point A that the AC of service provision equals the MC of service provision. Because of the MC and MR nexus, hospital would charge price P_1 and receive net revenue (profit) in the value of the difference between P_1 and AC that is the financial costs incurred for inpatient service provision. Also at point A, Q_1 would be an approximation of the full capacity or congestion of the hospital, which could be reflected by waiting lists for a bed. If hospitals are not at capacity or their congestion point, at the left of Q_1 , then MC would be less than AC and therefore AC savings would overstate the real cost savings in medical care for a avoidable hospitalization. While AC would equal MC, the equivalence would reflect **aggregate** behavior of **all** Delaware hospitals together.

A4. MC Estimation

The MC approach for evaluating financial cost savings of avoidable hospitalizations would be preferable under two conditions. First, AC and MC could diverge if Delaware hospitals were not characterized by congestion. Second, AC and MC would not be equivalent if each hospital in Delaware had different cost functions and behavior so that considerable variation in utilization and cost would be obscured by aggregate figures of AC estimation. Moreover, even if these conditions did not prevail, MC estimation **may** yield more precise estimates of financial cost savings. One, the reduced admissions due to CHAP could be assigned to the particular hospitals if their costs varied significantly. Two, admissions by the type of illness could be examined and employed for cost analysis. Three and relatedly, the LOS of an admission could be determined for each type of illness.

The MC estimation of cost savings attributable to CHAP would have the advantage of providing an econometric model that could be used for estimating hospital costs needed for future research activities. It would allow prediction of cost savings based on the number of expected (future) reductions of hospital admissions. The MC model is derived from hospital cost models (regression equations) that have been employed in the health economics literature. The MC model would require disaggregated data for each Delaware hospital. This could be obtained from federal data sets over a long period of time to obtain sufficient number of (statistical) observations since there are so few of Delaware hospitals. Alternatively, Delaware data could be obtained over time by patching together data from an array of data sets such as

Delaware Hospital Discharge data, Delaware Healthcare Association data and especially financial data from Delaware hospital themselves. The needed data are demonstrated by the variables required for estimating the econometric model. What follows is the most typical specification (formulation) of the short-run hospital cost model (the cubic cost function) from which MC can be derived. (While the discussion is technical, the reader should consider the variables and required data as the focus of central importance).

$$(1) \text{ TVC} = B_0 + B_1D + B_2D^2 + B_3D^3 + B_4OP + B_5OP^2 + B_6LOS + B_7LOS^2 + B_8CMI + B_9WI + B_{10}BED + B_{11}T + B_{12}U + B_{13}O + B_{14}HOSP$$

Where: TVC is the total costs of a hospital's operation in a period (e.g., year), generally measured as total non-capital expenditures of the hospital,

D is discharges for the period,

D_2 is discharges squared,

D^3 is discharges cubed,

OP is outpatient visits,

OP^2 is outpatient visits squared,

LOS is average length of stay,

LOS^2 is average length of stay squared,

CMI is the case mix (types of services) index,

T is total fixed asset,

WI is wage index,

BED is the number of beds,

T is teaching hospital,

U is an urbanization measure,

O is measures of ownership characteristics (public, private, nonprofit),

HOSP is hospital identification,

B_0 to B_{14} are the estimated regression coefficients.

The estimation of this equation, or variations of it, would permit the derivation of the MC of hospitalization. The following equations are respectively the average variable cost function and the marginal cost function from which values of average costs and marginal costs can be produced.

$$(2) \text{ AVC} = B_0 + B_2D + B_3D^2$$

$$(3) \text{ MC} = B_0 + 2B_2D + 3B_3D^2$$

The cost savings that could be obtained from an avoidable hospitalization (the output variable that is an avoidable discharge) by a CHAP enrollee (or any other individual) can be determined in the following way. First, identification has to be made of the hospital to which a CHAP enrollee (or any other individual) would have been admitted, but did not enter because of CHAP participation. Second, the number of the number of discharges (the output variable) for each hospital at the end of the period should be established from the available data. Third, the number of avoidable hospitalizations at each hospital should be added sequentially to the total number of discharges of each hospital and then the new separate totals, the values of D, should be substituted into (put in) the MR cost function (equation 3). That is, the values are multiplied by the coefficient value (Bs) of the equation. The resulting numbers would be the MC amounts that would be incurred if the CHAP enrollees were admitted, and thus they would be cost savings since these hospitalizations are avoidable.

IV. CONCLUSIONS

While the financial cost savings cannot be computed with available data, the AC savings are considerable per case for ED utilization reduction. The total AC savings are not large because of the limited number of participants who utilized the ED before and after enrollment. Both the total and per visit average costs are likely, however, to overstate the MC savings. Nevertheless, financial cost savings of avoided ED visits should increase if the CHAP expands through increased enrollment. Second, the MC and AC savings for avoidable hospitalizations are likely to be equivalent if Delaware hospitals are operating at capacity for admissions. The total financial savings are savings total are very small, since there were so few avoidable hospitalizations. However, cost savings are considerable for each hospitalization. The savings are likely to increase greatly if the program continues since it takes time for the primary care to have an impact on the health status of enrollees.

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