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Why the Neonatal Clinical Information System is Such a Valuable Tool

By C. Antonio Jesurun, MD, MMM and Leigh Ann Torres, CNNP

Quality patient care is dependent upon good and accurate communication. Verbal and handwritten communication have been used for years by physicians to try to deliver uninterrupted care to their patients. The explosion of both health information as well as the increase in volume of patients has influenced the delivery of that care--not always in a positive way. The use of computers to assist practitioners in the transmission of health information is a new idea. Electronic computer-based medical record systems were first applied in the 1960's[1].

Since physicians see so many patients, it is hard for them to appreciate the outcome of specific groups unless there is a system that can help them do that. Technology today can provide the tools to facilitate the collection of useful data so that groups of providers may be able to make more informed decisions regarding clinical care. Clinical information systems have been designed to assist the physician in managing patient information in a more efficient and understandable way. Having patient information readily accessible as well as having the chart available are some of the most important issues for physicians today. Complaints about trying to improve physicians' handwriting abound! The days of attempting to decipher illegible notes should be over. As practitioners we know some of the communication difficulties of the present system and have been looking for a less onerous method that will be more robust and help us improve patient care and outcome.

The purpose of this article is to discuss the value of one particular information system that serves as an electronic medical record (EMR), as well as to introduce the reader to its simplicity of use. Strengths, weaknesses, and ease of use will be discussed as well. This review is written from the perspective of the use of **The Daily Baby Center** from **Site of Care Systems** in a Pediatric residency training program.

Both quality patient care and resident education are essential. The Accreditation Council for Graduate Medical Education (ACGME) has mandated that residents develop at least the following six general competencies during their residency training programs:

1. patient care,
2. medical knowledge,
3. practice-based learning and improvement,
4. interpersonal and communication skills,
5. professionalism, and
6. system-based practice.

As we train the next generation of physicians, electronic clinical information systems will be essential tools that will help in increasing awareness of all of these competencies. Obviously, the organization of the Electronic Medical Record (EMR) can make or break these efforts.

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In 1992 Golichowski[2] discussed how:

"…clinicians are enthusiastic about taking information (e.g. laboratory results, clinical observations, dictated discharge summaries) from the computer but are less enthusiastic about giving information to the computer in a structured format…..Consequently, clinicians sometimes cling to narrative notes, however illegible, rather than accept clearly printed, computer-generated notes."

Attempts to streamline data collection and reporting must be easy to use. The user must want to use this tool, or the familiar worn routine of using the handwritten record will continue.

"Insanity: doing the same thing over and over again and expecting different results."
~Albert Einstein

What the System Can Do; What Do We Want It to Do?

One of the goals of patient care should be to improve health and at the same time minimize risks to the patient. Other goals might be to provide cost-effective, efficacious, quality care. While these goals are essential to residency training programs, resident education is another shared primary objective. Reinforcing the process of delivering quality medical care involves the consistent use of educational tools as well as frequent feedback. Not only is comprehensible and accurate documentation necessary for the delivery of quality care, but is also important for billing purposes. When a progress note or a history and physical has been completed, it serves not only to show what the resident is thinking, but how the resident is composing their thoughts to arrive at a specified plan of action.

Since physicians do not practice in a vacuum, we often need to share information either with other healthcare providers or at other practice locations. If information from labor and delivery and outpatient clinic visits can be integrated in this type of information system, this would be ideal. Repetitive data collection and entry is a waste of time! Mindless documentation of information that may be outdated or irrelevant adds to the possibility of additional errors. Lorenzi[3] summarized it well:

"We must implement the new technologies to do what they do best--structured, repetitive work--and let the people do what they do best—think, be creative, and solve problems. People are far better at reviewing boring work than doing it."

We know that events/history in the antepartum/perinatal/neonatal periods may have developmental consequences. Compartmentalized information that is not shared is counterproductive. Since billing/coding is another time-consuming activity, an automated system that can link functions would further reduce physician and billing agent time. With such a system, even the hospital could save time and money with appropriate DRG classification.

As long as we are asking a system to guide us through a specific communication process, we should also expect it to collect information on our patients for multiple tasks such as: outcome data, billing, and research.

Progress, Efficiency and Efficacy

Change is a given in our profession. American medicine is not practiced the same as it was even 5-10 years ago. Physicians pride themselves in rooting out inefficiencies of the system. There are many reasons for criticism of some of the inefficiencies of the American Healthcare System regarding communication/documentation. While space does not permit in this article to thoroughly discuss some of these inefficiencies, many agree that several problems are well known to the stake-holders and can be partially eliminated. One question is always the same: "How much time and money can be dedicated to improve the process so that the benefit exceeds the cost of time and money invested?"

It has been said that change comes about when the pain of doing business as usual is perceived to be greater than the cost of change. This is pertinent to the discussion of the use of a computerized clinical information system because of the initial time investment. Physicians have had considerable experience during their education and training at delaying personal gratification (short-term goals) to achieve greater benefits from long-term goals. Most clinical information systems attempt to provide the user with advantages that justify the time and financial investment. Efficiency and efficacy are important to patients, physicians, nurses, payers, as well as educators. It does not benefit the patient and providers to be efficient in the short-term if the long-term result (outcome) is not acceptable to all. Thus a computerized system that is easily and readily accessible that can guide a logical documented thinking process and is reviewed by an attending physician might improve clinical outcome. This process affords closer supervision of patient care. It is also not difficult for a computerized system to be used to collect data for later analysis.

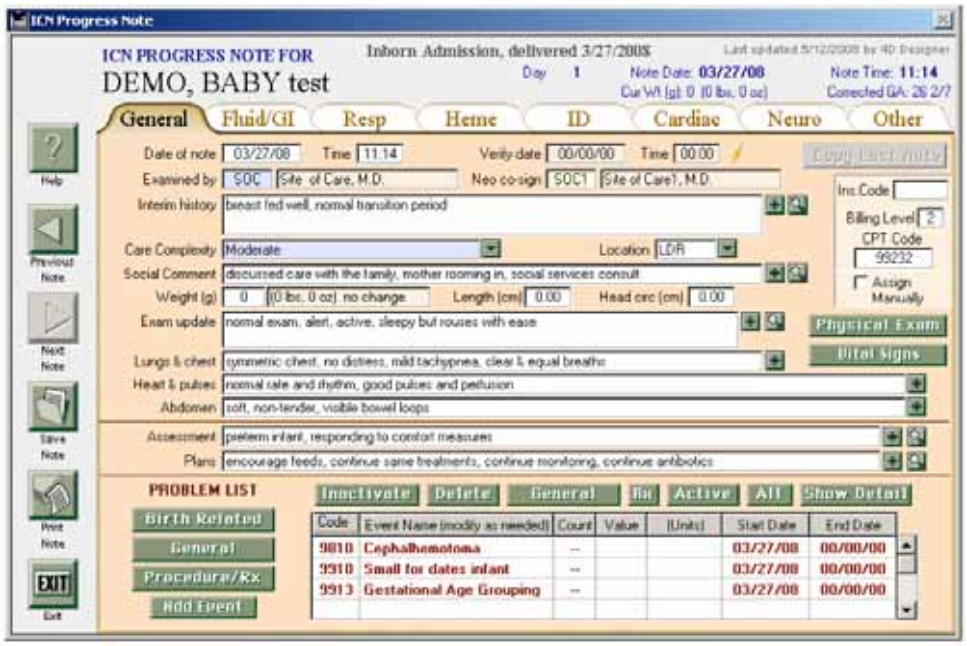

Figure 1. General tab

The Daily Baby Center

The Daily Baby Center from **Site of Care (SOC**) is a multi-faceted information system that provides the practitioner, a visually appealing electronic medical record (EMR). The program provides a consistent flow of ideas, thoughts, and plans for patients, from admission to discharge, including addendum notes and procedure notes. Each component of this system uses computer-generated templates, including drop-down boxes for ease of data entry. Once the final product is printed, it is reproduced in text format allowing the report to be comprehensive, legible, and easy to follow. The printed documents are used frequently for patient presentations during rounds and maintenance of the permanent medical record. This is very useful for attending physicians in teaching resident physicians, nurse practitioners, medical students, and nurses.

The **Daily Baby Module** of **SOC** offers a unique variant of EMR, where clinical information entered integrates: the maternal history and labs, delivery room resuscitation, physical exam (PE), and plan of care (POC). This information is entered on the initial documented note, the history and physical (H & P). However, keep in mind that the information entered into the EMR is very dependent upon the data obtained and entered by medical personnel. This is a very important aspect of a residency program, in which all residents and nurse practitioners may put all information obtained together to form a detailed and accurate record for the new patient. This same paradigm is warranted for continuity of care throughout the hospital stay.

How SOC Works - Creation of the Patient Record

History and Physical

Infants admitted into the Intensive Care Nursery (ICN) have their information entered into the SOC data repository. The first note that is created is the H & P. The creation of the record relies heavily on the medical personnel entering accurate information pertaining to the mother, infant, family, delivery history, and PE. After the data entry is completed and the '**Save**' button is selected, SOC will not save the record unless one admitting diagnosis is included. Diagnoses may be entered using an "**Auto Code**" button. The SOC system has an algorithm that analyzes the clinical data entered and suggests diagnoses, procedures, medications, and other events that have occurred during the admission process. Once diagnoses have been made the H & P can be saved. This can be done under the "**Events**" tab on the main "**Summary Screen**" page; using the drop-down box or entering partial

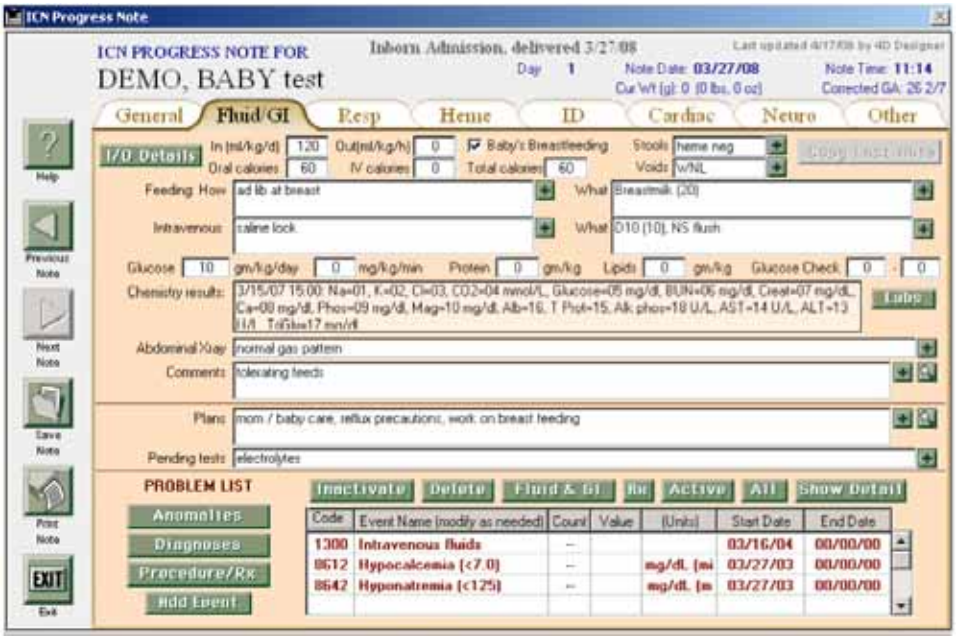

Figure 2. Fluid/GI tab

words for desired events from the problems list look-up tool. Thus, one has just created a "**Problems List**" (also called 'Events'). The diagnoses, problems, and medications are considered active until the event has been closed by medical personnel.

It is imperative that continued monitoring of all events is done so that ongoing patient management is adequately completed. Another reason for such diligence is that SOC records data may be used for research or quality improvement purposes; if the events are kept open inadvertently, the data will not be accurate.

Daily ICN Progress Note

The daily ICN Progress Note is probably the most crucial component in SOC, providing a continuum of care during the entire hospital stay. Each note is partitioned into organ systems allowing for detailed planning specific to diagnoses, medications, laboratory findings, impressions, and plan for each system. Each organ system tab also contains a specific problem list that is easily followed without having to scroll through the entire "**Events**" tab to assess treatment and/or diagnoses.

The first page of this note is tabbed "**General**" (Figure 1). This page makes it is easy to read and enter data about what has occurred over the past 24 hours. Any significant events are documented in the "**Interim History**" box. The box requires daily updating, as the patient's condition may change. This allows medical personnel to actively assess their patient as well as interventions employed; this in turn guides them in redesigning the Plan of Care.

Within the "**General**" tab page, there are many other useful areas for free text data entry which can be completed with the use of the "**Copy Last Note**" button. It is important for medical personnel to carefully read each note transferred, as it is probable that changes will need to be made. It is unusual that the progress note would continue to have the same information from day to day without any change. Each comment box will paint an active picture of the patient, i.e., daily weight, measurements, vital signs, and daily PE.

A brief comment about the "**Copy Last Note**" button; this utility allows the previous day's progress note information to be entered as a new note. This saves the practitioner from having to compose an entirely new note everyday. This is useful when the patient load is heavy requiring many patient progress notes to be completed.

Lastly, there is a comment box entitled "**General Plan**." Herein, the entire plan for the day is listed. The box placement within the EMR is very useful when assessing the plan of care for the patient. This is especially beneficial when another physician is following up for continuing care, such as during a night call. All one has to do is open the note and immediately look towards the bottom of the page and appreciate a snapshot of the plan. When the progress noted is printed, the general plan is located at the end of the note to allow for ready access, keeping the medical personnel from having to read the entire note to locate each plan for each body system. The general plan information can be copied and pasted to each body systems template, in the "**Plan**" box, to allow for continuation of the POC, specific for each system without having to re-type the plan on each page.

Fluid/GI

Nutrition is a major component in the care of the neonatal population. All of the fluid and calorie intake, plus urinary output can be documented in this template (Figure 2). Not only can the physician and nurse practitioner follow daily types of parenteral and enteral nutrition their patient receives, they must also critically analyze if the types are appropriate, and that continued use is warranted or addendums should be made. The primary constituents of parenteral nutrition are monitored via the calculations of glucose, protein, and lipids in grams per kilogram per day.

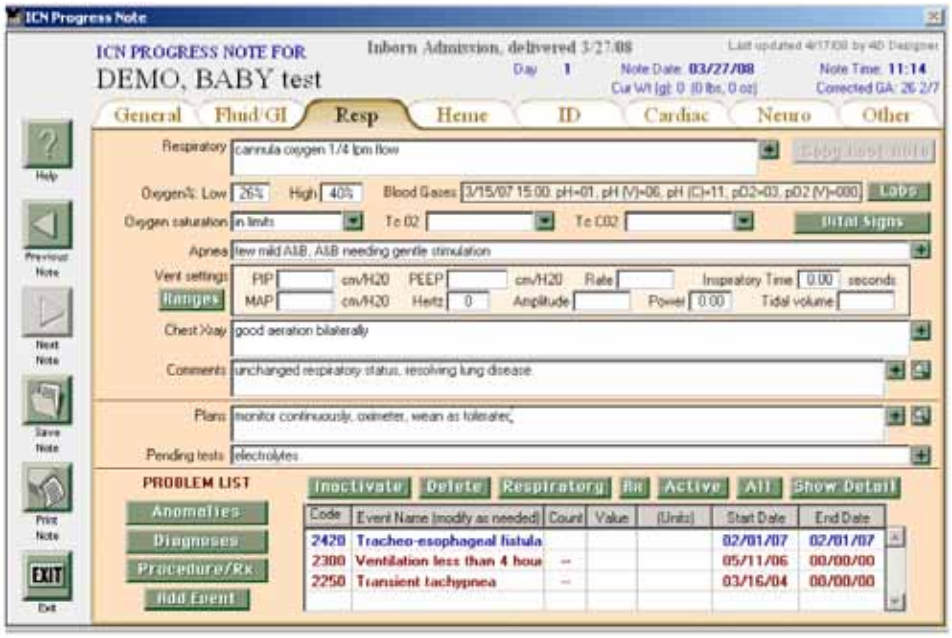

Figure 3. Respiratory tab

Other problems and events relative to fluid and nutrition of the patient, such as laboratory values and radiological imaging are recorded within the tab. An impression of the radiological study should be given in the appropriate comment box (Abdominal X-Ray), i.e. "dilated loops of bowel, no evidence of pneumatoses." This allows the practitioner to actively consider potential and differential diagnoses. Once a diagnosis has been given, rationale can be documented in the "**Comments**" box, supporting the diagnosis, reason for POC, and interpretation of lab values. The comments box serves as the practitioner's assessment.

Respiratory

The respiratory template is useful when it comes to managing all respiratory issues, including ventilator management, chest x-ray interpretations, and blood gas values. As previously mentioned, there are several areas located within the template for the entry of free text. The following will focus on two select areas of data input that are essential in keeping the progress note precise.

"Success at transitioning to an EMR will not happen just because of appropriate funding. Departing from the use of the paper chart which we have used for decades requires a culture change."

Most impressions about a chest x-ray are given by a radiologist, but ultimately, the responsibility of the practitioner is to concur or interpret findings that are accurate or pertinent about the infant's condition. The attending physician encourages the residents to commit to an interpretation and document their findings in the "**Chest X-Ray**" box. This guides them in interpreting findings that are usually only specific to newborns.

As the practitioner enters data on the patient, they can leave specific details about the condition, POC, and set goals to be met--i.e. ventilator management. There is a button entitled "**Ranges**," next to the ventilator settings box. When selected, a drop-down list appears for ranges to be selected. Manual entry can also be done within the appropriate marked fields. This makes it easy to see current settings and range goals desired when weaning or increasing settings is necessary. Goals can also be typed in the "**Comments**" box as well.

Discharge Summary

The utility of this note (Figures 4 & 5) is exceptionally helpful for compiling and evaluating the entire hospital course. Rather than having to shuffle through piles of paperwork, the final product is neatly represented in easy-to-read text in an average of 4-5 pages. When printed, the admission H & P populates the beginning of this thorough report, followed by a cumulative history which lists all events in body system format, a discharge PE, and lastly the discharge plans. The cumulative history is all-inclusive with start and end dates for each event. Another advantage of this system is that there is a narration of events in chronological order.

The discharge summary template has four tabs, labeled "**General, Examination, Diagnoses, and Plans**." Entering data is simple as the boxes and buttons within each page are self explanatory. Ensure that all events on the "**Diagnoses**" template are closed out before printing and saving the note. All active events appear in red while closed events appear in blue. The SOC system automatically codes the events using ICD-9 codes facilitating easier billing.

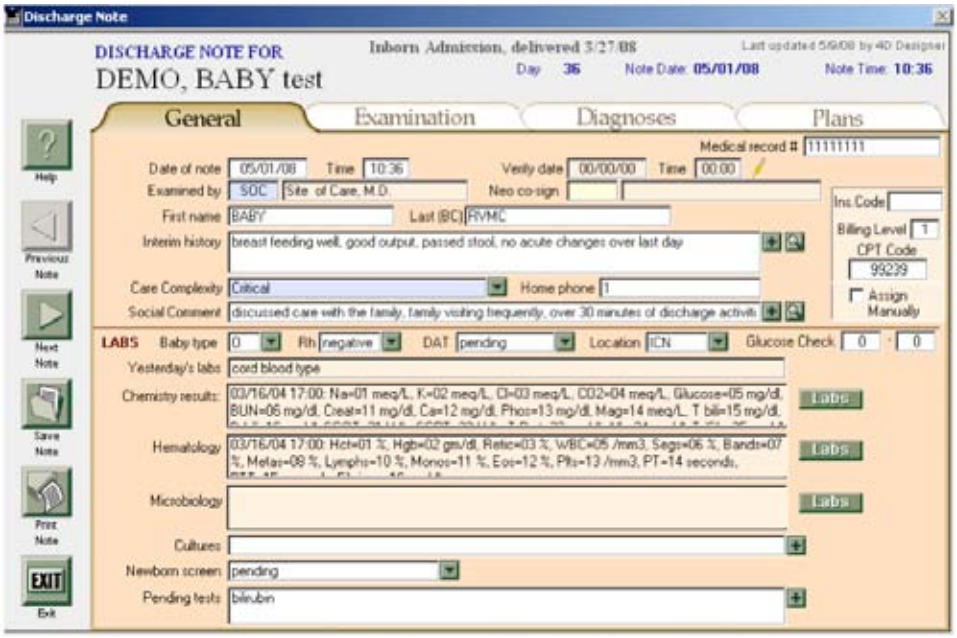

Figure 4. Discharge Note - General.

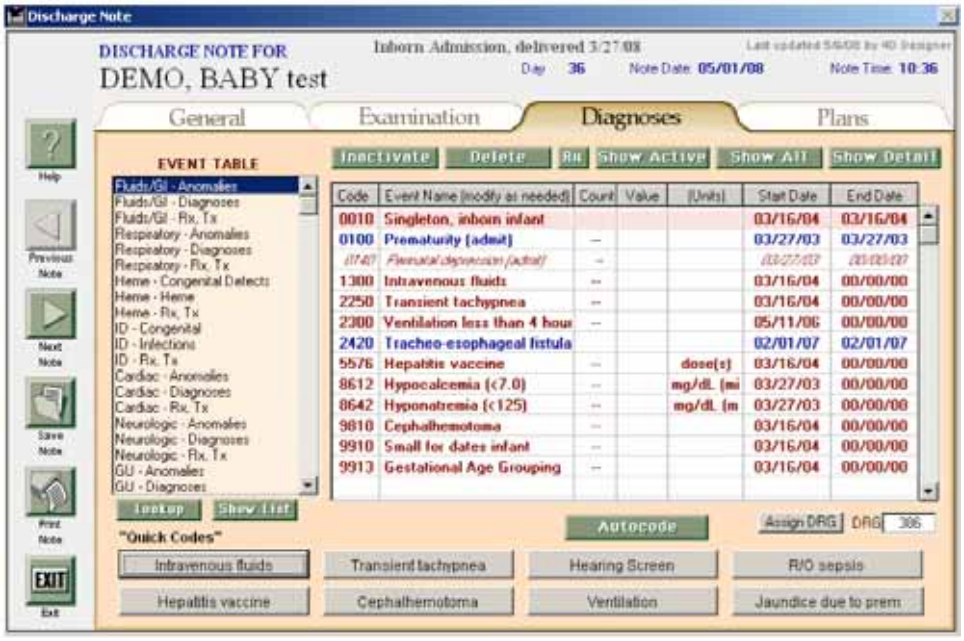

Figure 5. Discharge Note - Diagnosis.

Why it Works

What are the reasons that such a program can be effective? Stephen Leib[4] mentioned four critical elements of adult learning:

1. motivation,
2. reinforcement,
3. retention, and
4. transference.

Success at transitioning to an EMR will not happen just because of appropriate funding. Departing from the use of the paper chart which we have used for decades requires a culture change. This change is happening all over the world, and if medical staff does not keep up, individual professionals will be left behind. If the physician sees no relevance or need for use of this tool, they will lack the motivation to learn how to use it effectively. Personal and frequent interaction with the program and supervising faculty serve to motivate and reinforce communication skills as well as the thinking process. Use of the SOAP (Subjective, Objective, Assessment, and Plan) oriented note system is reinforced by the repetitive use of the same templates. Frequent use of the program makes it an interactive learning tool. This leads to familiarity and improved efficiency which leads to motivation and retention of skills. Regarding transference, there is no question that computer skills using other programs can improve maneuverability within this information system. Most physicians have experience at home or in their office with computer skills that improve their efficiency, whether they are for education, scheduling, tax preparation or personal banking.

One of the deficiencies of any data collection system may be the lack of standardization of common and even uncommon diagnoses. While this program standardizes lists of diagnoses and problems and has an extensive library, it is not so rigid that it does not allow for some flexibility. The local program administrator may add synonyms used in local practice. It is essential that the practitioners agree upon the definitions of some commonly used disease states (such as BPD, gestational age assessment, etc). Such program standardization allows for accurate data reporting to the Vermont Oxford Network as well as HEDIS and JCACHO.

From the practical point of view, opening and closing problems with start/end dates helps formulating the discharge summary concurrently. Few things are as onerous as the process of prolonged chart review in preparation for a dictated discharge summary. Sometimes the physician may feel that the dictated summary may be incomplete or not as accurate as they might like it to be. Composition of a discharge summary in the **Daily Baby Center** module does require a brief "**Interim History**." The server has been collecting events such as diagnoses, procedures, problems with the duration of events. Ventilation days as well as days in oxygen will appear on the final discharge summary automatically. Our neonatal service has had no outstanding discharge summaries since the inception of **Site of Care,** as the resident takes a few minutes to complete the discharge summary which will include discharge plans. A convenient feature of the program that may be

"Technology today can provide the tools to facilitate the collection of useful data so that groups of providers may be able to make more informed decisions regarding clinical decisions."

used is that the discharge summary may be sent by facsimile to the primary care physician's office or follow-up clinic.

Summary-Pros and Cons

The **Daily Baby Center** of **SOC** is very practical for medical personnel wanting to create a professional EMR and create a data repository. It allows for continuity of care between practitioners, offering a consistent and definitive plan of care; while simultaneously developing an accurate history of the entire length of stay. This system supports the educational process by breaking the patient's problems down by organ system and guiding the thought process with the use of drop-down fields. At the end of each daily progress note, the **SOC** system analyzes all information entered and will suggest events that are relevant to the patient's current status. It encourages the practitioner to think critically, and analyze each problem and intervention.

Minor drawbacks should be mentioned. Since the system separates the patient's problems into body systems, it is sometimes cumbersome for the practitioner to link pathophysiology between them. Many times diseases affect more than one system. Another slight imperfection in the system is that not all lab values are all located under certain tabs, in which one might think more appropriate, i.e., all hematology lab values are under the "**Heme**" tab, when it would be also be useful for the Complete Blood Count to also be listed under the "**Infectious Disease**" tab. Periodically, the system server requires refreshing in order to print reports. This is done in the file menu on the toolbar, only after the user has exited the notes, almost closing the patient's note. Of note-the billing function may require confirmation to assure the billing department as to its accuracy.

Other improvements that would be helpful might be the addition of Computerized Physician Order Entry (CPOE). This function, while not available, could lead to built-in reminders, guidelines, order sets, and improved drug orders. An interface with radiologic reports would also be helpful. While this system is always under refinement, it can not make up for habits of human nature to take short-cuts and failure to input correct information that make the system worthwhile. This is the reason that institutions need:

1. a project co-coordinator/ administrator as well as,
2. a physician advocate who will practice "due diligence". Their functions are both educational and technical. This will assure that the goals of using this tool will come to fruition. Any clinical information system is only as good as its users.

Our institution has been quite satisfied with the utility and versatility of **The Daily Baby Center** from **Site of Care Systems**. We feel that it has assisted us not only in delivering better care to our neonates but has been a valuable aid in teaching our residents how to communicate more effectively. We have been able to utilize the reports feature to customize data collection for quality improvement/research projects. While these benefits are not conferred upon the users automatically, enthusiastic support among the faculty is essential. The program is fairly intuitive and user-friendly. The responsiveness of the company to user input led to their receiving the 2007 North American Frost & Sullivan Award for Product Innovation.

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Birthing in Water: The Experience of One Midwest Tertiary Care Medical Center

By Richard Strauss, MD, FAAP; Paula Murphy, CNM, MSN; and Kathleen A. Curtis, RN, MS

The authors have indicated they have no financial relationships relevant to this article to disclose.

ABSTRACT

Objective. Human waterbirth has become more popular over the past two decades. Its advantages for the delivering mother have been described, but safety information concerning newborns has been limited. Our aim was to assess the safety of waterbirth for infants delivered by this method.

Patients and Methods. We prospectively studied 179 waterbirth newborns from May 2002 to April 2006, collecting information on side effects and outcome of this group and a similarly sized, non-waterbirth, vaginally delivered group of newborns from our Birth Center. Rigorous inclusion and exclusion criteria were used to ensure safe deliveries in both groups. Outcome measurements included time from delivery of the baby to emergence of the head from the water; complications, such as snapped umbilical cord, infection, and admission to the newborn intensive care unit; Apgar scores; length of stay in the hospital; and readmission to the hospital within a month of discharge.

Results. There were 179 infants in the waterbirth group and 130 infants in the Birth Center group. Both groups of mothers were demographically similar. No serious complications occurred in either infant group. Minor side effects such as snapped umbilical cord and skin infection were rare in both groups. None of the infants in the waterbirth group required hospital readmission.

Conclusions. In our medical center, waterbirth was as safe a method of childbirth as vaginal birth in the Birth Center. We encourage other medical centers practicing waterbirth to collect and report their experience.

Human vaginal birth under water, first described in western literature in 1805[1], has become a much more widespread method of childbirth over the past 25 years. Water immersion has been credited with positive physiologic effects for pregnant women during labor and delivery, including relaxation, comfort, pain relief, and ease of position change[1,2]. No benefits have been suggested or proven for the newborn, however, in fact, some investigators have raised concerns about risks and potentially adverse outcomes in newborns following waterbirth[3–10]. though others have described good outcomes in babies delivered by waterbirth[11-13]. Our goal was to develop a waterbirth delivery program that ensured safety for the newborn delivered under water. In this article we report the 4-year experience with 179 babies delivered by waterbirth in a single tertiary care medical center.

METHODS

The waterbirth program at Gundersen Lutheran Medical Center (GLMC), a 325-bed tertiary care healthcare facility in La Crosse, Wisconsin, began in May 2002. GLMC has a level III-B neonatal intensive care unit with neonatologists, pediatricians, and neonatal nurse practitioners/physician assistant available at all times to attend deliveries. Many months of planning, with extensive involvement of the departments of Pediatrics, Obstetrics and Gynecology, and Infectious Diseases preceded the first waterbirth. The comprehensive "Practice Guideline for Waterbirth" developed by this group outlined the patient inclusion and exclusion criteria (Tables 1 and 2), the required extensive staff education, the equipment dedicated to waterbirth delivery, the waterbirth delivery protocol, and evaluation tools. Guidelines concerning equipment, fall prevention, electrical and water safety standards, tub cleaning and disinfecting - as well as extensive protocols for procedures during labor and delivery - were developed and approved before the program began.

Table 1: Inclusion Criteria

1. Normal healthy woman with documented negative HIV, hepatitis B and C, expecting an uncomplicated delivery at term of a singleton infant in a vertex presentation who has completed the required program of preparation for a water birth.
2. Pregnant woman who is evaluated to be in active labor, vital signs within normal limits, fetal status reassuring, and no evidence of antepartum complications.
3. Woman in labor who progresses spontaneously without evidence of fetal intolerance to labor.

Table 2: Exclusion Criteria

- Medical conditions
  - -pre-existing conditions (diabetes mellitus, heart disease, severe asthma, hepatitis, HIV, for example);
  - -conditions starting during pregnancy (hypertension, poorly controlled gestational diabetes mellitus); or
  - -nicotine addiction (smoking any amount after 28 weeks gestation)
- Non-vertex presentation
- Multiple gestation
- Preterm gestation under 37 weeks
- Postterm gestation over 42 weeks
- Non-reassuring fetal heart rate pattern or any condition requiring continuous fetal monitoring
- Placental abruption or unexplained vaginal bleeding during third trimester or during labor
- Arrest of labor requiring pitocin or mechanical intervention
- Prolapsed cord or any other obstetrical emergency
- Thick meconium, or anticipation of a depressed newborn
- Rupture of membranes >18 hours, temperature >38° C, maternal antibiotic treatment
- Substance abuse
- Hypertensive disorders that develop during intrapartum period
- Epidural anesthesia
- Previous Caesarean section
- Previous delivery with shoulder dystocia
- Other maternal conditions (at the discretion of the admitting obstetrical practitioner)
- Infection at the time of labor such as active genital herpes, hepatitis, HIV, skin infection
- Enteric infection
- Previous stillbirth

GLMC's protocol for care of the newborn delivered by waterbirth stated that with emergence of the newborn's shoulders and body, the newborn was to be lifted to the surface without delay. The umbilical cord was to be clamped and the infant was to be kept warm by maintaining skin-to-skin contact and water immersion with the head out of water. The baby would subsequently be admitted to routine newborn care in the same manner as any other well newborn. Among other orders, the waterbirth tub water temperature was set by the delivering patient between 36°C and 39°C (97°F–102°F).

Waterbirth was made an option for women experiencing normal pregnancies with documented laboratory testing negative for human immunodeficiency virus (HIV) and hepatitis B and C who expected uncomplicated vaginal delivery of a singleton infant in the vertex presentation. It was also a requirement that maternal and fetal evaluations during labor indicate no maternal complications or fetal intolerance to labor. Women who chose waterbirth delivery were required to complete a prenatal education course on waterbirth, and along with the practitioner, review a "statement of understanding," a document that stated that participants had been educated about all aspects of waterbirth and had freely chosen the procedure.

The Birth Center is a freestanding labor/delivery/recovery/postpartum birthing room located on the GLMC postpartum unit. It does not have central electronic fetal monitoring. Its inclusion/exclusion criteria are very similar to those for waterbirth, the only difference being that waterbirth mothers must test negative for HIV, hepatitis B, and hepatitis C.

Evaluation included selected maternal and newborn outcomes, patient satisfaction survey, staff satisfaction survey, readmission and infection rates for mothers and infants, and reports of staff injury and infectious diseases exposure.

Data collected concerning the waterbirth mothers included gravidity, parity, gestational age, estimated blood loss, and intrapartum complications (cord problems, meconium, and third- or fourth-degree lacerations).

Data collected concerning the newborn included Apgar scores, weight, temperature at 5 minutes of life, need for resuscitation, time from delivery of the head to emergence of head and body above water, length of hospital stay, umbilical cord events (cord snap, cord around the neck of the baby), need for neonatal intensive care unit (NICU) admission, and other complications. In addition, surveillance data regarding infection and readmission were collected for the first 30 days of life.

RESULTS

During the 4-year study period, 179 babies were delivered via vaginal waterbirth in GLMC. From May 2002 through October 2004, 130 vaginal births took place in the Birth Center, at which time we stopped collecting information on that group. Demographic information and outcomes/complications concerning the two groups are listed in Tables 3 and 4, respectively.

The average length of time from birth to emergence of the head from water was 1.8 seconds (range 0.3–8 seconds); measurements were done in 61 waterbirths. Shortly after implementation of the waterbirth program, nurses reported that the time from birth to emergence of the head from water was so short that it was not possible to start and stop the stopwatch accurately; nonetheless, all nurses were sure the time was only a few seconds in all the instances in which it was not measured.

Temperatures at 5 minutes of life ranged from 36.4°C to 39.4°C with a mean of 37.4°C; the single infant with temperature 39.4°C had a normal temperature at 1 hour of life. This infant's mother tested negative for group B Streptococcus, her temperature was 37.1° C, and she was in the waterbirth tub for 43 minutes. Temperature at 5 minutes was unavailable for 4 babies.

Mean Apgar scores and infant weights were similar for the 2 groups (Table 3). We reviewed patient charts for the 5 waterbirth infants with Apgar scores of less than or equal to 7 at 1 minute of age: Three of the infants had nuchal cords, and 4 required minimal stimulation. In all instances, Apgar scores at 5 minutes were 9. One waterbirth baby was admitted to the NICU following meconium aspiration; after initial bag/mask ventilation, the baby was intubated at 6 minutes of life. The baby had minimal respiratory distress, was extubated the next day, and was transferred to the newborn nursery 27 hours after delivery. These infants experienced no other complications, nor did any of them require extended hospitalizations. Snapped umbilical cord occurred in 1 waterbirth patient, but that infant had no adverse effect as a result. One patient in the Birth Center group experienced shoulder dystocia. The average length of stay was 1.8 days for both groups of babies.

Infection rates and other complications for the first 30 days of life were comparable between the 2 groups (Table 4). One wa-

Table 3: Outcomes of Waterbirth and Birth Center Infants

Infant Outcome	**Waterbirth** *(N=179)*	**Birth Center** *(N=130)*
1-minute Apgar (mean)	8 (range 1-9)	8 (range 2–9)
5-minute Apgar (mean)	9 (range 3-10)	9 (range 7–10)
Weight in grams (mean)	3585	3600
Temperature @ 5 minutes (mean)	37.4° C*****	******

*****Temperature at 5 minutes was not available for 4 waterbirth infants.
******Data on Birth Center infant temperatures were not collected since this group did not have the potential risk of hypothermia of the waterbirth group; according to standard practice, temperature was measured between 5-10 minutes of life.

Table 4: Infant Complications Within 30 Days After Delivery				
Complication	**Waterbirth**		**Birth Center**	
	n	**%**	**n**	**%**
Conjunctivitis & other eye infections	4	2.2	2	1.3
Respiratory infection	0	0	0	0
Sepsis	0	0	0	0
Ear infection	0	0	0	0
Readmission	1	.5	0	0

terbirth infant was readmitted for an apparent cyanotic episode. Extensive evaluation, monitoring and follow up were all normal.

DISCUSSION

Information concerning outcome of babies born by waterbirth is limited. Most of the literature has been anecdotal, and the majority of it, at least in the pediatric literature, has been negative[3–10]. Several European studies have shown no difference in outcome between waterbirth and land birth infants[12–16]. Studies involving large numbers of patients born in the same medical center have not been published in western literature, and blinded, prospective, or randomized studies have yet to be done.

A recent Cochrane analysis of water immersion for labor and childbirth concluded that the effects of water immersion during pregnancy and childbirth were unclear[12-16]. Results of a small, randomized, controlled, pilot study found no difference between waterbirth and land birth outcomes; the investigators suggested that an adequately powered, multicenter, randomized, controlled trial was feasible[18].

Our study is limited in that it is not randomized, blinded, or controlled, nor does it have enough patients to reach statistical significance; it does, however, represent a relatively large number of consecutive waterbirth patients delivered in a single medical center compared with a similar group of vaginally delivered babies on land. It may also be limited because the time from birth to emergence of the head was not precisely measured and documented in every waterbirth.

CONCLUSIONS

Waterbirth has been popularized over the past 25 years in the United States and other countries, yet safety for the newborn born under water has not been clearly established. Our experience showed that waterbirth was safe for newborns delivered by healthy women in a facility with a well-developed waterbirth program. Overall, we found the experience of waterbirth to be very safe for mothers, babies, families, staff, and practitioners. We encourage other centers providing waterbirth to report their results.

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Medical News, Products and Information

Would You Allow Your Child to Participate in Medical Research?

Advances in medicine – new treatments, cures, vaccines and medicines – are driven by research involving humans. But when it comes to medical research that requires children to be involved, researchers often struggle to find participants.

The reason? Many parents are often unwilling to allow their children to take part in medical research, fearing that they may be harmed or used as "guinea pigs," according to a report released today by the University of Michigan C.S. Mott Children's Hospital National Poll on Children's Health.

In fact, the report finds that only 30% of parents are willing to allow their children to participate in research involving a new medication. In contrast, 77% of parents want only FDA-approved medicines for their children. This finding reveals a large gap between the proportion of parents who want safe medicines for their children, and those who are willing to have their children take part in research that could ultimately produce information about medicine safety. Most notably, the majority of parents (92%) say that the reason their child has never participated in a research study is simply because they've never been asked. The report, however, does reveal some very promising results for researchers: 25% of parents polled indicated that they would consider allowing their child to participate in research as a healthy volunteer and another 36% would consider it if their child had a particular disease being studied.

"Parents, physicians and other advocates in the community must encourage a national discourse on the importance of research, and also improved funding for pediatric research to ensure more progress can be made in treating and preventing childhood diseases." Valerie Castle, MD, Chair of the Department of Pediatrics and the Ravitz Foundation Professor of Pediatrics and Communicable Diseases at the U-M Health System says.

The National Poll on Children's Health found parents are more willing to have their children participate in research when it is encouraged by their children's doctor.

In an effort to increase government funding of children's research, C.S. Mott Children's Hospital recently joined a coalition made up of the nation's leading pediatric medical research institutions to support a new approach to address the continued under-funding of federal support for pediatric research.

The coalition – which has the support of all the major pediatric research societies – recently lined up behind a bill called the Pediatric Research Establishment Act. Introduced by Sen. Sherrod Brown (D-OH) and Sen. Christopher "Kit" Bond (R-MO), the bill is designed to not only authorize increased funding for cutting-edge pediatric research, but also create a new structure to maximize the efficiency and effectiveness of pediatric disease research.

For its report, the National Poll on Children's Health used data from a national online survey conducted in December 2007 and January 2008 in collaboration with Knowledge Networks Inc. The survey was administered to a random sample of 2,131 adults, ages 18 and older, who are a part of Knowledge Network's online Knowledge-Panel[SM]. The sample was subsequently weighted to reflect U.S. population figures from the U.S. Census Bureau. About three-fourths of the sample were households with children.

For the complete report and podcast about poll results, visit: www.med.umich.edu/mott/research/chearnpch.html.

To learn more about Knowledge Networks, visit www.knowledgenetworks.com.

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Factors Other Than Age Affect Preemie Survival

Premature infants are more likely to survive-and survive without a disability-if the baby is female, from a single birth, is of a higher birth weight, and if the mother has received steroids to help the baby's lungs mature before birth, says research partially conducted at University of Alabama at Birmingham (UAB) and published in the April 17, 2008 issue of the New England Journal of Medicine. The combination of factors is more important than the single issue of gestational age.

Waldemar Carlo, MD, Professor and Director of the UAB, Division of Neonatology, said researchers in the National Institute of Child Health and Human Development (NICHD) Neonatal Research Network observed 4,446 infants born between 22 and 25 weeks gestational age. These extremely low birth-weight infants, those weighing less than 1,000 grams, or 2.2 pounds, make up about 1% of babies born in the United States each year, or roughly 40,000 babies a year. More than 150 extremely low birth-weight babies are born at UAB each year.

"These infants are born in the 22nd through the 25th week of pregnancy-far earlier than the 40 weeks of a full term pregnancy," Carlo said. "Many die soon after birth, despite our best attempts to save them. Some survive and reach adulthood, relatively unaffected. The rest experience some degree of life-long disability, ranging from minor hearing loss to blindness, to cerebral palsy, to profound intellectual disability. In deciding the kind of care to provide, traditionally, physicians have relied heavily on an infant's gestational age because it is known to play a large role in the infant's survival. We knew that the closer a baby was to the 25th week, the better its chances. But, it often is hard to calculate a baby's gestational age. It's easy to miscount by a week, and that could make a large difference in the baby's chances of survival. We wanted to know other factors that play roles in survivability so that we can help new parents make decisions regarding the care of their premature infant."

Using standardized measures of mental development, vision and hearing, the researchers assessed the health status of surviving infants when the infants were from 18 to 22 months corrected age-the age they would have been had they been born full term. Carlo said 21% lived and did not have a disability while the remainder died or experienced some degree of disability. They determined that infants were more likely to survive-and more likely to survive without disability-if they were of older gestational age, their mothers had been given corticosteroids to help mature their lungs, if they were female, were a singleton rather than part of a multiple birth, and been of a higher birthweight.

The NICHD is making the study available on the NICHD Web site http://www.nichd.nih.gov/about/org/cdbpm/pp/prog_epbo/.

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