Our vision is to provide a true electronic replacement of the handwritten maternity record.
The OLD Maternity Information System Approach

What is wrong with traditional attempts at maternity information systems?
Before setting out our vision and new approach to the electronic patient record, it is worth a quick look at the all too recognisable problems with traditional approaches. Does some of the following sound familiar?

Maternity Information System Secondary to the Written record
Clinical interactions are handwritten on paper in the clinical notes and also subsequently entered again into the Maternity Information System. Multiple entry wastes time and is frustrating to clinicians.

Duplication
The same data is handwritten many times on many different paper forms and entered many times in different computer systems. Repetition leads to transcription errors.

Poor accuracy
When a report is printed from the Maternity Information System the data is wrong and inconsistent. Reports are unreliable so they are not used to drive our Governance and Management processes. The data collected by the Maternity Information System cannot be used to improve patient care.

Poor compliance
The data entered into the Maternity Information System is a repetition of data that has been recorded in the notes so sometimes people forget or don’t bother to enter it into the computer. When a report is printed the numbers don’t add up. We have no confidence in the data we produce.
Retrospective entry
Following the delivery, Midwives spend a lot of time, usually 40 minutes or more, sat at a computer with the handwritten notes in front of them transcribing information into an electronic form. This is a chore that is resented especially when a better use of midwifery time would be spent supporting the mother and newborn.

User Interface is not fit for the purpose of giving care
Electronic Patient Records are no more than Electronic forms that do not encourage clinician-patient interaction. They do not replace the handwritten notes which are still required to facilitate these interactions.

Multiple Computer Systems – No Integration
The computer systems don’t talk to each other so you go to different systems to find out the information needed; PAS, PACS, Lab, BloodGas, CTG, MIS, Baby Numbering, fetal medicine – all separate islands of information.

Audit especially CNST Audit
Audit is done by hand. We spend considerable time identifying which cases we want to look at then we have to order the notes from medical records. When they arrive we have patient notes everywhere and it takes a team (usually clinicians) to go through the notes to get the information we need. CNST audits are dreaded and are very hard work indeed. Valuable clinical resource is taken away from the clinical environment to undertake this work. It is so difficult for us to achieve and then maintain the higher standards of CNST and bring valuable savings to the Trust.

Payment By Results
The Trust does not get paid for a significant part of the work we do because of our unreliable and incomplete electronic data. It is a real effort for our coders to profile the care we provide and produce our Hospital Episode Statistics.
Trust data returns
The information department is responsible for compiling detailed reports for a number of important bodies for example the Commissioners, Care Quality Commission, CEMACH, National Screening Committee and Office for National Statistics and in Scotland, the Scottish Birth Record (SBR) and Scottish Perinatal and Infant Mortality and Morbidity Report (SSBID). Compiling these returns are never straightforward and are seldom accurate or complete.

Top Down Imposition
Previous experience of maternity system procurement has invariably been a top down approach. The systems installed do not have a clinical focus nor do they meet our clinical needs. Much of the data is collected in the wrong form and our suppliers have not been interested in taking on board our local requirements and customisations. When they do they want to make significant charges which is felt to be unfair.
The K2MS New Approach

Our Vision: is to provide a true electronic replacement of the handwritten maternity record.

Electronic Patient Notes
To mark our break from the past approaches we shall never again use the term, ‘Electronic Patient Record’. From now on we shall use the term, ‘Electronic Patient Notes’ (EPN) to emphasise that our new approach puts the clinician-patient interaction first and foremost from which all the benefits of the captured electronic information will then naturally flow.

Elevating the electronic note to THE clinical record
Athena captures the patient’s notes electronically which means the electronic note IS the clinical record – it is not a duplication of the handwritten record, there is no handwritten record – the handwritten record is replaced. A system that can do this then unleashes the full benefit of captured electronic data that we have all known to be possible from computer systems but until now has been entirely illusive. The Electronic Patient Note enables the following to flow automatically:

Accuracy
Every clinician knows the importance of an accurate clinical record so now that the electronic record is the only record – it will be respected and treated with the same reverence as the former handwritten note. The Electronic Note is bound to be accurate.

Compliance
Now that the Electronic Note is THE Note, there will be full data entry compliance.

Completeness
Now that the Electronic Note is THE Note, all relevant information is completed, for all patients.
The Benefits
We have all heard the adage, ‘rubbish in – rubbish out’ and it is true, but equally it is true to say, ‘You get out, what you put in’. The benefits of fully compliant, complete and accurate data means that all the information benefits of the electronic note can be realised. Information generation now becomes a bi-product of the process of giving care. No longer an added process, no longer an added burden.

Removal of Paper
No more paper CTGs (to get lost, fade or misplaced), no more paper partograms, birth notification forms to Child Health, paper reports from labs, unreadable handwritten clinic notes, no more fiddly plotting of vital signs, growth and fundal heights. The pain of the handwritten record is removed. Whether and how much of the removal of the handwritten record leads to the removal of paper in the patient record is up to you. Most hospitals will probably want to keep a print out version of the patient notes and this can be accommodated using printed summaries. These print outs are copies of the electronic primary note and subordinate to it. There is no effort required in generating these paper copies other than pressing a print button.

Entered Once, Used Many Times
Data should be entered once and used many times, wherever and by whoever requires it. A patient hospital number, demographics and GP details will not need to be entered in Athena because this data will have been entered (once) into PAS. Lab results flow to the patient record over the hospital network. Maternity clinical data is entered once during the patient interaction and once only. It is then used in an electronic form or printed form, whichever is appropriate by other Healthcare Professionals, Managers, Administrators and Information officers as required.
User Tempting, User Rewarding
‘User intuitive’ used to be the phrase most often quoted when describing the standard for software to aspire to. But that is not enough for K2. Of course the software must be easy to use and require minimal or no training but to gain user acceptance, and preference over handwriting, it must be much more than this. Users, when they view the software should feel some excitement, they should feel inspired and tempted to start using it. When they do use it they should feel a sense of reward for having done so. Their effort should be low and attainment high. There should be gratification in using the software.

At K2 we employ a number of graphic artists and have specialists in human computer interaction to ensure our software is fit for purpose, looks stunning, and exceeds all expectations in terms of performance and utility.

Contemporaneous, at the Point of Care
K2 provides software that is designed to be used contemporaneously and at the point of care during a patient interaction, even in emergency situations. Compare this with traditional maternity systems which tend to rely on retrospective entry away from the patient space. Contemporaneous and at the point of care ensures the software facilitates the consultation. It enables a review of care, captures the interaction and then helps plan future care. A whole new approach to the incorporation of maternity software into the workspace and work activity.

What you see depends on who you are, where you are and what you want to do.
The K2 Athena Software is not a single view of the patient record, it is not a ‘one size fits all’ presentation. The view and functionality that is presented depends on who you are, what you are and what you want to do. This is important not only to help utility but also in adherence to the Caldecott Principles of patient confidentiality.
Seamless, Single Database
K2 Athena captures the patient notes across the whole pregnancy care pathway, booking, screening, scanning, investigations, antenatal outpatient contact, in-patient contact, labour and delivery, postnatal in-patient and out-patient, neonatal intensive care, and care in the community. It captures notes and real time data from medical device equipment (CTGs, Blood pressure, infusion stacks, ventilators and incubators and vital signs monitoring). K2 Athena captures all this into a single seamless database. The impressive benefit of this single resource comes at the point of reporting and audit.

Reports and Audit
What you get out of a maternity system should be at least as important as what is put into it, but often it is forgotten. Think of the knowledge and wisdom that could be gained from a population database of complete patient pregnancy and birth information from thousands of mothers and their babies. A rich resource such as this could be available to a Trust after just a single year’s use of Athena. Reports on a day to day, month to month or year to year basis can be produced to help manage patient care. They are simple to create and we have a catalogue of templates to start with.
CNST – The Ultimate Audit
K2 Athena is built to help you achieve your CNST aspiration. The data is complete and accurate and the patients that fulfil specific CNST criteria can be identified at a click of a button. Another click and the full electronic patient notes can be viewed. This really is the future.

Connectivity
K2 Athena can be accessed at anytime from anywhere in the World. It can be accessed from a computer over the internet or from a mobile phone using the internet or cellular networks. This powerful connectivity affords care in the Community in GP surgeries and Children’s Centres as well as the mother’s home. Clinicians can get a real time update of all the activity on the labour ward including CTGs, partograms and notes. Reports and Audits can be undertaken from any location, again, anytime, anywhere.

Customisation
K2 is able to fully customise Athena to meet your local requirements. This is a real break from past approaches by other manufacturers who rely on either shrink wrapped software or software that resides on a database remote from the Trust that is shared with all Trust customers. This is not the K2 approach. We expect that you will want to comply with the many standard datasets but also that you will want to add some data fields to embody your own approach. The inherent design of Athena makes this all possible.
Welcome to the Future of Healthcare Computing

The K2 Athena System is a real step forward compared to past attempts. K2 have used their clinically focused approach to bring together all aspects of recording care.

The power is the fusion of information technology and internet connectivity with clinical notes, direct plug in and capture from any medical device equipment right at the heart of the patient location: contemporaneous at the point of care.
The Entire Pregnancy Care Pathway

The K2 Athena Systems offers a seamless product that spans the entire Pregnancy Care Pathway. We believe it is the first such product ever developed.
Seamless Database

K2MS Athena uses a Microsoft SQL Server Database to store all data collected across the whole pregnancy and postnatal pathway. This is important because it means that reports, data queries and audits can be complied using information and criteria drawn from any period throughout care. For example,

‘SHOW ME: the notes of all nulliparous women who acquired gestational diabetes, were induced at gestation greater than 41 weeks and who had a Caesarean Section with a cervical dilation greater than 5cm and less than 10cm for failure to progress and who had a subsequent postnatal hospital stay greater than 8 days.’

This is just an example but we hope makes the point. Imagine the power of a database of complete and accurate data with this detail and breadth, from all pregnancies collected over just one year in your hospital. Pure gold.

A single seamless database is not only important for Governance but it also facilitates research and most importantly informs a continuous improvement process. This is essential for achieving the highest levels of CNST compliance.

Single Maternity Database - Entirely Developed by K2

The database and all software has been entirely developed by K2 Medical Systems. K2MS Athena therefore uses a single database which means that it is seamless. There are no joins or gaps in the data and no internal interfacing, which is a big problem for multiple supplier solutions.

We do not rely on other manufacturers for any component of Athena. All software is developed by K2 software engineers.
K2MS have developed powerful interfaces to allow Athena to share information with other key systems, within the hospital and outside. Athena has a very wide reach indeed facilitating connectivity with the community, hospital based systems, third party systems, PAS, PACS, LAB and NN4B. In fact no matter where you are on the Planet, Athena can be reached and patient information or reporting shared using computers or mobile devices (with appropriate authentication of course).
Athena Components

Scope and Scale
Think of K2 Athena as a collection of many components. These components can be purchased in their entirety or they can be purchased individually. This approach allows each hospital to tailor the maternity system that they require to meet local needs, scale or budget. Additional components can be added as and when required, at any time, and as new components are developed, these can be added too.

The remainder of this brochure will give you an overview of the components of Athena that are currently available. These have been split into sections comprising,

- Community Services and Remote Connectivity
- Antenatal Hospital Services
- Labour and Delivery Services
- Postnatal Services
- My Athena Space
- Support Services
- CNST and Governance Services
Community Services and Remote Connectivity

Community Communication with K2WebConnect

K2WebConnect is K2 technology that provides a powerful link between the hospital and the Community. K2WebConnect uses a secure internet connection meaning that the Athena system can be accessed from anywhere in the World via an internet connection. The internet connection can be from wired, wireless, or mobile phone network.

K2WebConnect provides the communication infrastructure to connect any mobile hardware solution from outside the hospital to Athena inside the hospital. In terms of providing connectivity from community care to the hospital, it is therefore a matter of Trust preference as to which hardware solution serves your local needs best. It’s your choice!

Laptop, Panel or Digital Pen for Care in the Community?
The short answer is, it is up to you. K2 provides a solution for all mediums and there are strengths and weaknesses with each.
Laptop or Panel?
In our experience, a low spec laptop is preferable to a panel largely because a standard keyboard is preferable to a touch keyboard for this application where potentially a large volume of written text might be required.

Mobile Network for Community?
A solution that depends 100% on online connectivity is not going to be workable despite all the progress that has been made with mobile connectivity. The nation’s mobile phone network does not have sufficient coverage to achieve this. Furthermore, providing 3G contract licenses to all those that might need it is likely to be prohibitively expensive and impractical.

Digital Pens?
There has been some good work done with digital pens in the community, particularly in Portsmouth where a collaborative project to assess the technology by Portsmouth Hospitals IT and midwifery teams and the commercial company PaperIQ. K2 has signed a partnership agreement with PaperIQ and so this is a solution that K2 can offer too. Like all solutions, Digital Pens has its advantages and disadvantages. On the plus side it is easy to use and facilitates the hand held record; on the downside, the costs of the special paper forms is expensive and subject to copyright and there is less quality control on data that is recorded as there is with software entry. Furthermore there is an infrastructure cost for the Trust in terms of supplying mobile connectivity with the Blackberry™ network as well as back end server costs.
Electronic Online ‘Handheld’ notes

According to the Office for National Statistics: in 2011, 77% of all UK households have internet access. It is true to say that it is very much the minority of pregnant women who do not access the internet. This realisation has led K2 to rethink how best to facilitate the Woman’s hand held notes. K2 has responded to this changing demographic by, for the first time, providing Women with internet access to their hand held record.

With K2 Athena, Women can securely access their hand held record via the internet using a PC, laptop or mobile device. K2 has the web presence, infrastructure for example and experience to provide this service. There are currently over 100,000 midwives and doctors all around the World accessing the K2 Perintatal Training Programme.

The electronic ‘handheld’ notes are a very effective way for women having to attend hospital outside their home locale to grant access to other care providers who may be called upon in an emergency for example.
The Online ‘Handheld’ Notes ‘My Athena Space’ are also useful for hospitals to provide self help, Hospital Guidance and advice materials.

For those women who do not have access to the internet they can of course receive a printed copy of their record whenever they attend an antenatal appointment in hospital or GP surgery.

**Antenatal Booking**

Antenatal Booking can be accommodated in any location using K2 WebConnect technology; In the Woman’s home, GP, Children’s Centre or in hospital. However you currently do it in your Trust.

Athena captures the full booking history including all the subject areas you would expect including Demographics, Family History, Social Profile, Lifestyle, Previous Pregnancies, Medical History and Care Team Assignment.

The software has been designed to be quick to complete information and care has been taken not to ask questions that are not relevant. A theme throughout all data entry are the rules behind the scenes that check to make sure all information is checked for range and consistency. The best time to ensure data quality is at the time it is entered!

**Community Visits**

Any subsequent community visits can also be captured in the same way as the booking.
What if there is no connection from the Community to Hospital?

Athena does not depend on an internet connection from the Community to the Hospital. If there is one, Athena will use it to provide up to the minute information about the clinical notes. If a connection is not expected to be available (K2 thinks this should be the working hypothesis) then a Community Midwife’s case load for a day can be down loaded into her mobile device (laptop or panel) as a ‘snap shot’ and stored locally.

Any modifications that are made ‘offline’ will be synchronised back into the Woman’s electronic hospital notes when a connection is next established, perhaps when the Community Midwife returns to her home or back to base.

Antenatal Hospital Services

Screening

Athena will capture all the pregnancy screening requirements including Chromosome and Anomaly Screening, Infections, Haematology and Father’s Screening.

We have researched a number of hospital data requirements for screening and we are also compliant with National Screening Committee dataset requirements. We capture all important aspects of screening offers and status as well as provide the means for Women to access important information on screening via their online handheld notes.

Interface to Hospital Labs

K2 provides an interface to most Hospital’s Laboratories which means that results from the lab can automatically be assigned to the electronic notes. This information is added in a controlled way to mitigate possible sources of human error.

Abnormal Screening results are flagged up and brought to the attention of assigned care givers.
Fetal Assessment

Scan images and Measurements
Athena provides a connection to your scanned images, measurements and results stored in your Hospital Picture Archiving System (PACS) using WebPACS. K2 also have a DICOM interface for direct connection to Obstetric Radiology System.

Clinical Interpretation and Management
The capture of the clinical interaction surrounding the acquisition, interpretation and management plan can all be captured by Athena.

Invasive Procedures
Athena will capture invasive procedures such as amniocentesis, CVS and Cordocentesis. Again, no need to capture this information as a handwritten record.
Antenatal Care Planning Tool

It is likely that hospitals will want to ensure that all women receive an appropriate level of planned care throughout their pregnancy. To help ensure that all women receive a consistent level of care, proportionate to their specific needs, K2 has developed an Antenatal Care Planning Tool.

NICE has provided a set of planned contact profiles for Women with different needs and these are a good place to start. There is a planned contact profile for Nulliparous Woman, Multiparous Women, Women with a multiple pregnancy and another for Women with diabetes. NICE also makes recommendations as to what should take place during these interactions.

Athena accommodates such contact profiles to help ensure that all planned care is consistently managed.

It is important to emphasise that these planned care profiles can be modified to suit your Unit’s specific requirements. Any number of plans can be created and thereafter can be modified as required.

For any Client it becomes easy visually to see which clinics have been attended and what observations have been made.

During the interaction, your Trust’s guidelines, relevant to the specific appointment are presented to guide the course of consultation.
Antenatal Clinic Capture

K2 Athena provides the means to organise all antenatal clinics including Routine Antenatal Clinics, ECV clinics (with automatic capture of the CTG), Diabetes and High Risk Clinics. Women can be referred to clinics either by their planned care profile or they can be referred manually to any number of specialised clinics you would wish to define.
To facilitate the interaction K2 Athena has an incorporated clinical interaction tool that helps guide the Consultation. The seven key steps to the Interaction are,

<table>
<thead>
<tr>
<th>Step</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Referral:</strong> The reason the patient is attending. This might be planned care or it might be a referral to a specialist clinic. A reminder of the Trust Guidelines for the tasks to be undertaken are presented.</td>
</tr>
<tr>
<td>2</td>
<td><strong>History:</strong> All relevant information collected so far is presented in a clinically logical format.</td>
</tr>
<tr>
<td>3</td>
<td><strong>Observations:</strong> Previous observations are charted and new observations are added.</td>
</tr>
<tr>
<td>4</td>
<td><strong>Investigations:</strong> Blood, Urinalysis, Scans etc can be ordered. Athena has an interface to the laboratory to present status. Investigations that have been completed can be reviewed during the Consultation.</td>
</tr>
<tr>
<td>5</td>
<td><strong>Diagnosis:</strong> Current working Diagnoses can be recorded. All previous Diagnoses are presented for review and possible closure.</td>
</tr>
<tr>
<td>6</td>
<td><strong>Management:</strong> All decisions regarding making a plan are recorded. Referrals can be made.</td>
</tr>
<tr>
<td>7</td>
<td><strong>Communications:</strong> Letters are generated and sent via email or printed out.</td>
</tr>
</tbody>
</table>
Day Assessment with antenatal CTG
Admissions to the Day Assessment Unit and all observations and notes throughout the stay can be entirely captured as part of the electronic patient notes.

CTGs will automatically be captured too.

Observation charts and/or MEWS charts are also incorporated throughout the antenatal period where required.

Non-Stress Tests
We have spent the last twenty plus years developing intelligent algorithms to help interpret the CTG for labour (INFANT) and for use antenatally as part of a ‘Non-Stress Test’ (INFANT NST). A computerised approach to CTG interpretation should help improve the consistency of interpretation and we hope improve clinical decision making and reduce human errors.
Maternity Telephone Helpline Capture

Many Units operate a dedicated Midwifery Helpline and this can all be provided as part of Athena. This means that all calls to the helpline can be summarised and recorded as part of the Client’s record. Guidance can be given in line with the Unit’s policies and procedures, and referrals can be made.

Telephone Consultations can be recorded anywhere throughout the hospital for example, Delivery Suite, Antenatal Clinic or Day Assessment.

One important advantage of using Athena to capture Maternity Helpline calls is that client notes can be accessed on the spot and used to refer to throughout the call.

Statistics of common reasons to call, caller demographics and outcomes can all be married up at the click of a button.

Antenatal In-Patient

Athena captures the clinical notes electronically for antenatal in-patient stays. This includes the narrative, observations, investigations (with interface to the laboratory), working diagnoses and clinical plans.

Observation Charts including MEWS charts are provided and can be configured to meet your local requirements.

Notes can be captured on a variety of hardware platforms, tablets, panels. PCs and the K2 Portal medical grade bedside computer.

Ad hoc and routine CTG’s can be captured as required, high dependency care patients can also have real time monitoring captured using the K2 Portal bedside medical device hardware.
A profile of all current admissions and bed-use can be reviewed at ward central stations or indeed anywhere on the hospital network or remotely.

**Triage**
Many Units operate a Triage service to better manage all possible admissions to maternity services.

Athena accommodates this approach. The Bedsides will have K2 Portal Hardware available to capture any CTG monitoring. MEOWS charts are available to capture observations, and partograms can be started if appropriate.

On transfer to labour ward or antenatal, the Triage interaction is reviewed seamlessly and forms the starting point for all subsequent care.

All information relating to what happens to women during Triage and subsequent transfer or return home is captured and can be reviewed and reported on.

**Modified Early Obstetric Warning Score (MEOWS/MEWS)**

K2 have developed an Electronic Modified Early Obstetric Warning Score (MEOWS) component for use in maternity care. This can be used antenatally or during labour or as part of high dependency care.

The K2 MEWS is entirely configurable to meet your local requirements.
Labour and Delivery Services

K2MS Guardian™
Guardian is K2’s solution for the labour and delivery ward. It combines the benefits of IT hospital wide communication with bedside capture of the labour notes electronically. Guardian is scalable and at its simplest level it can provide a CTG Archiving and Surveillance solution. The full implementation of Guardian can remove the handwritten record entirely from Labour and Delivery, including obstetric emergencies, anaesthesiology and surgical notes.

Guardian – Full Implementation
Guardian can remove the handwritten record from all aspects of labour and delivery. The power of taking this step comes with subsequent audit and reporting and CNST.

K2MS Guardian™ provides the full electronic capture of patient information during childbirth including: Intermittent auscultation, CTG’s, partograms, all labour events, capture of obstetrics emergencies, outcome information, fetal blood sampling results and cord blood gas results direct from the blood gas analyser.

The high integrity of Guardian data means that the audit reports it generates can become one of the main driving forces behind your governance quality approach to care.

The K2MS Guardian™ system facilitates communication between mother and clinician in the 1m² space at the head of the bed providing a focal point for interaction at the bedside. This means that the mother can become more involved in the management of her care. No more filling paper notes with backs turned to women.
Central Stations
Conventional fetal monitoring occurs only in the delivery room and it is up to the clinician at the bedside, often the most junior, to involve more senior staff at their discretion. This over-reliance on junior staff has long been recognised as a problem leading to human error. Guardian will communicate all relevant clinical information outside the delivery room to senior staff who can review the patients on the labour ward routinely and efficiently. All information can be considered including CTG’s, partograms, annotations, alarms and labour events.

Medico Legally Robust
Guardian uses finger print recognition for authentication, a robust electronic signature.

Fast, highly accurate capture and authentication of thumb or finger print. The system extensively validates all data input, disallowing data that is in error, but also warning of extreme values that are entered. This inbuilt intelligence helps ensure data integrity.
Guardian can be run without a keyboard using a touch screen interface, which reduces the size of the computer and removes the problems of contamination and failure of the keyboards etc.

Robust fit for the demands of 24/7 Delivery Suite

K2MS Guardian™ has been designed to be robust technically, such that no single fault can bring it down; not even if the server or network goes down. Patient details can still be entered, central surveillance and dial-in will continue to function with no loss of performance. This enables us to be confident to guarantee an up-time of 99.9% per year.
Artefact Heart Rate Detection Algorithms

K2 have developed algorithms to detect and warn at times when artefact is being recorded.

**Computer detection of Inadvertent recording of Maternal Heart Rate.**

It is not uncommon for the maternal heart rate to be recorded inadvertently when using an ultrasound transducer. This has been shown to be a familiar theme in babies that suffer an unexpected poor outcome with neurological damage with subsequent medico legal action.

The Guardian algorithms look for the characteristic nature of the maternal pulse and warn when there is a suspicion it is being recorded. This provides an opportunity to check signal sources and readjust transducers accordingly.

**Computer Detection of Fetal Heart Rate Doubling and Halving**

Guardian Algorithms will also detect occurrences when the fetal heart rate is being incorrectly doubled by the fetal heart rate recorder or incorrectly halved.
INFANT is software to interpret fetal heart rate monitoring and support subsequent clinical decision making. It has taken us over 20 years to develop. It has taken this time because correct CTG interpretation is difficult. On the one hand INFANT must be good at detecting problems within all manner of patterns and on the other hand it must not be over sensitive so as to raise concern unnecessarily. Achieving this balance is very hard, for human and computer.

INFANT analyses the FHR and contraction pattern and alerts clinicians to potential problems in a timely way. INFANT has been validated on databases of several thousand interesting, abnormal and challenging traces and has been found to perform at the level of experts whose ability we have measured.
The INFANT Multicentre Study of 46,000 Births

The ability of INFANT to improve poor outcomes is currently being assessed in the largest maternity study ever to be funded by the NHS – The INFANT Study. This work is led by Professor Peter Brocklehurst and the Institute for Women’s Health at UCL and the National Perinatal Epidemiology Unit at Oxford University. The study commenced recruitment in January 2010 and will recruit 46,000 deliveries from 16 leading hospitals in UK and Ireland.

INFANT has all the regulatory approvals in place to be sold commercially but K2 took the decision to postpone a full market release until after the INFANT Study completes. We felt this was the responsible thing to do, believing strongly that new technologies should be properly evaluated in controlled environments prior to widespread patient use.

INFANT sites (so far)
- Glasgow (x2)
- Dublin
- London (x4)
- Plymouth
- Portsmouth
- Liverpool
- Manchester
- Warrington
- Nottingham (x2)
The K2MS Portal™ is a sleek, ergonomic, robust, medical grade touch screen PC with all electronics fully integrated. No need for an intrusive, cumbersome, heavy trolley which can give an over medicalised impression. It is easy to clean and has been designed to reduce the risk of bio-contamination. The K2MS Portal™ complies with the medical device standards and is used when there is a requirement to connect to patient monitoring equipment, for example a fetal heart rate recorder. The Portal can connect directly to any of the popular fetal monitors. As well as meeting the medical device standards for patient electrical isolation, it also meets the standard in terms of its resistance to the ingress of liquids, flammability rating and mechanical integrity. CONVENTIONAL PCs DO NOT.

The Portal has been purpose designed and developed by K2 Medical Systems especially to cope with the special demands of labour and delivery.
Caesarean Section Electronic Notes
K2 has developed a Component to fully capture the surgical and anaesthetic notes relating to Caesarean Section electronically. This includes all Caesarean sections, unplanned and planned. Caesarean Section capture makes recording the details of the operation straightforward and also ensures that the hospital’s statistics in this important area are complete and representative of the entire population of sections that are undertaken, including electives.

As this electronic capture replaces the handwritten record and is therefore the clinical note, statistics and outcomes are accurate and complete.

With this data the contribution to the overall rate can be broken down using powerful analysis by way of, for example, the 10 Robson Groups. Hospitals can then compare the relative contributions to the overall rate of inductions, electives, emergencies etc. to investigate trends and differences.
Mobile Labour Ward – K2 MobileConnect

With K2 MobileConnect all activity on labour ward can be viewed from your mobile phone or panel, wherever you are in the World using either wi-fi or the mobile Cellular Network.

All manufacturer’s mobile devices are supported, not just Apple.

All Women admitted can be viewed via the mobile Chalkboard. Each can then be viewed in detail presenting the CTGs (if running), Partogram and clinical notes. All the information is live and auto updates every 5 seconds.

With K2MobileConnect it is possible to stay connected with the labour ward anytime inside your hospital and from anywhere in the World.
Second Stage Maternal Observation Module

During Second Stage observations are required by NICE to be made more frequently than first stage and charted accordingly.

K2 have developed a component streamlined to make these regular and frequent observations efficient. This ensures that time spent entering observation results during second stage can be kept to a minimum thereby maximising clinical time with the client and the delivery.

Our intention was to provide an electronic means of recording the necessary observations as quick, if not quicker, than using a handwritten record.

We have not compromised the strength of our medico-legally robust authentication process, but we have tailored data entry to recognise the higher volume of observations that need to be recorded.
Scribing Tool for Contemporaneous Electronic Noting during Obstetric Emergency

Scribing during an obstetric emergency is difficult. It is difficult if using the handwritten record (some rely on paper towels!) and it is very difficult indeed to scribe the events during an obstetric emergency using computer.

K2 has solved the problem with our Electronic Scribing Tool.

Forceps, Ventouse, Maternal Haemorrhage and Shoulder Dystocia can all be captured contemporaneously and at the point of care using the K2 Scribing Tool.

With a single click of a button, clinical actions and events can be recorded and time stamped. A log of the unfolding emergency is captured. A narrative can be documented contemporaneously too. Following the emergency, retrospective accounts can be added (and time stamped accordingly) using the contemporaneous log as a structure. All modifications, additions and embellishments are recorded as such so that it is always clear which notes were made at the time and which were made afterwards.
Planning Component for Labour and Delivery
K2 have developed a Planning Tool to help establish and then implement agreed clinical plans. The tool acts as a way of reminding when certain actions need to be carried out (VE in two hours, review syntocinon, call doctor if no improvement within an hour etc). Reviews and actions can be planned ahead of time and reminders with a list of outstanding tasks can be displayed.

The planning tool is an important component to ensure that an agreed clinical plan is adhered to especially over shift change boundaries.

Anaesthetics Component
K2 have developed an anaesthetics component to capture the full anaesthetic note electronically. This includes all uses of opioids and the full documented procedures of providing regional anaesthesia and analgesia. The details of the insertion and administration of anaesthetic drugs are fully captured. General Anaesthetics are also captured. The anaesthetic component will then also assist in the follow up of patients, printing out a patient list report of all those who are currently admitted to postnatal ward and who require specialist follow-up.

The anaesthetic component will also facilitate the reporting of statistics surrounding the administration of regional pain relief.

The anaesthetic component entirely removes the hand written anaesthetic note from maternity services. The data collection is comprehensive and will facilitate the UK National Obstetric Anaesthetics Database (NOAD) returns and similar.
Intelligent Electronic Chalkboard (IEC)

The chalkboard is an important tool for use on the Central Delivery Suite. K2 have taken the strengths of the handwritten chalkboard and have enhanced this with functionality that can only be provided electronically.

The K2 Intelligent Electronic Chalkboard (IEC) not only communicates current Labour Ward room occupancy and status, it does a whole lot more.

The first important feature is that all information presented on the K2 IEC accurately reflects information from the bedside. No need to enter it twice. As each clinical procedure is undertaken in the room, a summary is automatically updated centrally on the chalkboard.

The K2 IEC also communicates risk status using a colour coded system that makes identifying the labours with greatest risk factors apparent. The INFANT concern levels are also indicated on the Chalkboard.

The K2 IEC is also a planning tool and communicates the status of the care for each woman and what actions are pending.

The K2 electronic chalkboard can be displayed large (widescreen TV) or small and in multiple areas. Issues relating to patient confidentiality are incorporated of course. The chalkboard can also be configured to meet your own local requirements.

<table>
<thead>
<tr>
<th>Rm</th>
<th>Situation</th>
<th>History</th>
<th>Assessment</th>
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<th>Expectations</th>
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<tr>
<td>1</td>
<td>ANNIE B 32Yrs G2 P1 36Wks +5</td>
<td>08:00 3cm+2; Epi; Lac 4.1; SROm 09:00 Synt on 10:00 Synt</td>
<td>AbN 1st</td>
<td>[Call for help at birth] [BSL 1h; sliding scale; beware shoulder dystocia] [IV access, monitor, avoid prolonged 2nd stage]</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>GERTRUDE C 28Yrs G3 P2 37Wks +4</td>
<td>08:00 3cm, +2 09:00 Epi 10:00 3cm+2; Epi; Lac 4.1; SROm 11:00 FBS 4.1</td>
<td>Needs IOL Path. CTG</td>
<td>[Call for help at birth] [BSL 1h; sliding scale; beware shoulder dystocia] [IV access, monitor, avoid prolonged 2nd stage]</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>ANNIE B 32Yrs G2 P1 36Wks +5</td>
<td>08:00 3cm, +2 09:00 Epi 10:00 3cm+2; Epi; Lac 4.1; SROm 11:00 FBS 4.1</td>
<td>Slow 1st</td>
<td>[Call for help at birth] [BSL 1h; sliding scale; beware shoulder dystocia]</td>
<td></td>
</tr>
</tbody>
</table>
Resource Planning and Management Tool

The Resource Planning and Management Tool allows you to keep track of staffing levels and compare these with the varying clinical demands that unfold.

The resourcing information can be displayed as a maternity Dash Board. This information can also be compared with the different clinical demands which happen. Pinch points can be identified. This information can be used in a live sense for example deciding if and when non-acute care plans should commence, for example, inductions of labour.

The Resource Planning Tool also provides important information for CNST.

Delivery and Post Delivery Outcome Module

The Delivery and Post Delivery Module removes the handwritten record from this intensive data collection period. All too often in the past this was the time of much data entry duplication on paper forms and ‘old style’ maternity information systems.

The K2 Delivery module removes duplication and attempts to capture as much of the data contemporaneously. Data is captured once and used many times. All birth notifications are compiled and printed or emailed as appropriate.

Post Delivery Screen
This component saves considerable midwifery administrative time post-delivery which means midwives can better support the mother and baby. This module is also very important for units wishing to rely on their K2 Athena System to compile and present their delivery statistics and reports.

**Electronic Perineum Operation Notes**

The notes relating to the repair of the perineum following delivery can be completely captured electronically. Full details of the methods and materials used are captured. An electronic drawing tool allows sketches to be captured too.

The Perineum operation notes removes the need for a handwritten record and also makes subsequent analysis and compilation of statistical reports straightforward and accurate.

**Athena Notes Screen**

**Drawing tool for perineum repair**
National Numbering for Babies (NN4B)

K2 Athena includes a component that will collect the maternity minimum dataset and upload this to the NHS central issuing computer to obtain an NHS number for the Baby (NN4B). This is then stored in Athena.

K2 make a commitment to ensure that this service will be updated as the NHS updates its methods and processes to ensure continued compliance and service, at no additional charge to hospitals.

Expert Datacare – Analysis of umbilical cord blood and scalp samples.

K2MS Expert DataCare obtains all fetal blood sampling results and cord blood gas analysis directly from the blood gas analyser which are then sent straight to the bedside and stored to the database there are no transcription errors also paired cord blood gas analysis are validated by Expert DataCare. Feedback is given as to whether a sample has been obtained from BOTH the umbilical artery and vein (a common error is to obtain two samples from the vein – true in 30% of cases). Expert Datacare will then provide an interpretation of outcome based on acid-base balance provided.

Medico-legal protection

Cord results validated by Expert Datacare provide an important protection from subsequent litigation. It has the power to stop litigation before it even gets started. Cord results can also identify babies who have been exposed to hypoxaemia and who may be at greater risk during the immediate neonatal phase.

Trending Data

Expert DataCare can be used to capture the immediate outcomes of all deliveries and when done so gives important information about how changes in practice influences outcomes.
Postnatal Services

Postnatal Ward Capture
All aspects of admitted Postnatal care is captured by Athena for both mother and baby. Observations, investigations, involvement of other support services and a narrative of the care provided are all included.

Athena can facilitate the development of a postnatal care plan. Hospital approved Help and Information literature can be provided. Breast feeding advice and support can be provided in a structured way and documented.

Baby blood spot labels to facilitate the UK Newborn Screening Programme are produced. Interactions with Other Support Services such as Clinical Psychologists can also be captured by Athena.

Baby Discharge Examination - NIPE
Athena provides the means to capture the Paediatric Newborn Exam and this has been updated to conform to the Newborn and Infant Physical Examination (NIPE) Programme. This examination applies to all newborn discharges from Labour Ward, Postnatal Ward or NICU.
Discharge Component
The Discharge of Mother and Baby is accommodated by Athena. Notifications to Child Health, CMW, GPs and Health Visitors are automatically communicated. Notifications are sent to key referrals for example newborn hearing screening.

All discharge documentation to community services can be sent electronically or by paper, as required.

Postnatal in the community
In a similar way to the antenatal capture of interactions in the community, Postnatal community capture is fully embraced by Athena. This includes Health Visitor Checks and the 6-8 week check and sign off.
My Athena Space

A Mother's Athena Space – Online Hand Held Notes
Athena allows Women to log on to view their ‘hand held’ notes online. There is a specially created view that presents a summary of all care interactions to ensure information is shared. Information is provided on a read only basis and access to these handheld notes is controlled by password by the Client. If a woman were to require care whilst out of area then she is able to share her password with other care givers so that they can then access relevant information relating to the pregnancy.

In the Mother’s Athena Space she is also able to access important self help and advisory literature. This provides the perfect mechanism for women to have access to Trust policy and help whenever they need it. It saves expense on hardcopy publication and provides the best means to control versions.

A Clinician’s Athena Space

Athena provides a view for all clinicians on an individual basis that shows all aspects of care that they have been involved in. This is important for continuing professional development and for professional qualifications and publications.

All clinicians can review;

- My Clinic Appointments
- My Patients currently booked
- My Things to do
- My Referrals
- My Caesarean Sections
- My Forceps and Ventouses
- My Perineum Repairs
- My Births
- My Regional insertions
- My Resuscitations
- And more

There is also a link for clinicians to research Trust guidelines and Policy.
Support Services

Interfaces
As a philosophy K2 believes that data should be entered once and used many times which is why we have invested considerable effort in developing powerful interfacing software. There is probably no general interface methodology that we have not used to establish meaningful integration with other manufacture’s equipment and hospital IT systems.

General Interfacing Methodologies Supported
K2 have developed HL7 interfaces to PAS systems and Laboratory Systems, DICOM interfaces to image based systems, ODBC connections to third party databases, XML and serial protocols to many different patient monitoring equipment.

Specific Interfaces K2 can provide
K2 can provide interfaces to you Patient Administration System (PAS), Laboratory, PACs system, Badger Neonatal System, PACs images, all fetal monitors with a digital interface, blood gas machines, vital signs machines and ventilators.

K2 offers compliance with the NHS Interoperability ITk initiative. K2 can also host third party web applications embedded within our software.

Dependent Services
The reach of Athena is wide indeed. It is a hospital resource that will be relied upon by many support services throughout the Hospital, in the community and within the Primary Care Trust.

Athena provides key information to the:
- Clinical Psychologists
- Social Workers
- Neonatologists
- Child Health Department
- Newborn Hearing Screening Services
- Information Services Dept
- Bed Management Services
- Clinical Resource Management
- Payment by Results Teams
- Coding

The technical capabilities of Athena in terms of its presentation and communication flexibility means that any dependent services that require information from Athena can have it. Accurate and up to date.
Benefits Realisation

Reports and Analysis

The capture of the electronic medical record by Athena is a fundamental requirement but equally important is the ability to analyse and report on the information that has been collected.

Audit, Governance, Process improvements, Clinical Research and Management Control all become possible when you have a database as rich as Athena’s. A database that is accurate and complete.

K2 have developed an impressive report generating engine. Any report can be constructed. Statistical reports from any date range, for births or bookings at any related site can be produced. Patient list reports that identify groups of patients with any particular common criteria can be produced. It can bring up a set of identified patient notes at the press of a button. You can identify patients by combining filter terms. For example: show me; all patients who delivered last month who had a twin pregnancy AND vaginal delivery with a gestation > 35 weeks. Any set of terms can be strung together in this way.

Any combination of filters can be combined to identify interesting groups of patients or outcomes.

Data Export

All report findings and patient lists can be exported in a comma separated variable CSV format at the press of a button for easy import into Microsoft Excel or the like.
Consultancy
K2 can provide experienced staff including K2 Midwives to help you get the most from your reporting and continuous improvement processes. K2 staff can work with you in the clinical locale to support changes in work flow, troubleshooting and can also help build reports and present findings.

K2 has expertise in CNST audit and can provide staff to assist you in the pre-audit compilation of information.

To support you further, K2 has developed some powerful software that fully embraces the CNST Standards and Criteria. This component makes searching for patients that fulfill each criteria straightforward. It will also identify patients who fall into multiple criteria. **Powerful indeed.**

Imagine obtaining your CNST notes at the press of a button! With Athena this becomes possible. We can also support you with K2 midwifery staff on site in the pre-audit assembly of cases and information. In partnership with K2 Athena, CNST Level 3 becomes a realistic aspiration for your hospital.

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CNST Software Component
The financial and clinical rewards for CNST compliance are significant. K2 is fully aware that Athena will be a cornerstone in any hospital’s aspiration for higher CNST level.

The information strategy we have adopted, contemporaneous at the point of care together with Athena’s electronic clinical notes and replacement of the handwritten record means you are off to the best start possible. All data is captured. All data is accurate.
Payment by Results
Athena will provide your hospital with the information you require to ensure you are properly reimbursed for the services you provide. In the past, all too often Trusts have been underpaid because the data they maintain has not been sufficiently accurate or complete enough for the job. It is likely that many Trusts have been significantly underpaid.

Athena ensures complete and accurate data. That is the key starting point. Add to this the power of Athena’s reporting capability and now you have a system that can accurately reflect the services you provide.

K2 have Payment by Results components that fully embrace the new Maternity Pathway System. We can also provide you with Hospital Episodes Statistics (HES). With this component, K2 gives you the undertaking to ensure ongoing future compliance to these standards as they are updated and modified.

Dataset Compliance
The dataset captured by Athena is extensive and entirely configurable. It has to be, it is the clinical record. Athena can be tailored to any data collection requirement, national or local. K2 can confirm compliance with the following,

England and Wales
The Maternity Services Secondary Uses Data Set sets
West Midlands Perinatal Unit Maternity Dataset
CEMACH
Care Quality Commission
CNST

Scotland
Scottish Woman Health Maternity Record
Scottish Birth Record
Scottish Morbidity Report
Real-time Community Health Index numbering
National Perinatal Network
The National Perinatal Network is a new initiative being led by K2 and its Partner sites. It is a co-operation that aims to bring together in a single online presence key maternity metrics from all K2 maternity sites and even sites without K2 software. The National Perinatal Network will be set up as an independent, not for profit Foundation that seeks to improve maternity care through the sharing of maternity hospital care metrics and experiences and by co-operative research initiatives.

K2’s role in this initiative is that of facilitator. K2 has the technology to bring a national online presence. Our partner sites have the clinical and research experience to establish the aims and focus for the initiative. A partnership between technical and clinical partners, a synergy for the greater good of maternity care.

Sharing of key maternity metrics
All K2 maternity sites and non-K2 maternity sites will be able to upload key identified maternity metrics. Partner hospital organisations will analyse, compare and write up findings. Participating hospitals will be able to compare their metrics with sister hospitals and hospitals from further afield.

Original Research
The Clinical steering group will be able to identify interesting areas for research and the data required to facilitate this research will be captured by Athena. A co-operation of this sort will enable research questions to be answered that might have been difficult for a single Trust or group to answer on their own. The power of co-operation and a focused combined research initiative. This research will then be written up and published.
# Glossary

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