

Technology:

VB, ASP, IIS, MS SQL Server

Project size:

4 Man-Months

Team size:

1 Developer, 1 Manager

A&E Patient Monitoring System

New A&E 'traffic-light' based monitoring system allows staff to avoid breaches of the 4-hour rule and tracks patients in real-time as they are moved around the hospital.

The Client

Established in April 2000, the East and North Hertfordshire NHS Trust manages three busy hospitals: Hertford County in Hertford, the Lister in Stevenage and the Queen Elizabeth II in Welwyn Garden City. In addition, the Trust also has management responsibility for the Mount Vernon Cancer Centre in Northwood, Middlesex.

Between them, the Lister and QEII hospitals provide a wide range of major acute surgical and medical inpatient services, including A&E, critical care and maternity. They also provide care to people on an outpatient basis, as well as ante/postnatal, radiology and pathology services.

With resources of around 5000 staff, an annual budget of £240 million, and 860 inpatient beds, the Trust serves 500,000 people in South East England. Of those, well over 376,000 patient visits are made to the Trust's outpatient departments every year and 55,000 patients are admitted for care.

The Client's Problem

The length of time patients have to wait in Accident & Emergency is one of the key issues for the health service and much effort has been put into improving these

by hospital trusts. In line with recommendations made in the Government's NHS Plan for England, a 'see and treat' incentive scheme has been in place since 2004 aimed at reducing A&E waiting times:

No patient should spend more than 4 hours waiting in A&E departments - from arrival to admission, transfer or discharge - other than in exceptional circumstances.

Meeting national targets for keeping within the recommended 4 hours has meant a cash incentive to trusts of £100,000 to spend on capital projects.

Clinicians agree that almost all patients attending an emergency department could be assessed and either discharged or admitted within four hours if appropriate systems and processes were in place.

However, before a patient in A&E is admitted into hospital for further care, transferred or discharged, there can often be a lengthy chain of decisions, tests and treatment.

When delays occur at any or all of these stages, long waits in A&E can result.

Some A&E departments have set up clinical decision units (CDUs)

Department : Paediatrics	
Go to : Paediatrics	
GP referral	Doctor
	All Departments
	CADMU
	Majors
	Paediatrics
	Streaming
	Triage
	X-ray
	Medical Records
No doctor	
No doctor	

"No patient should spend more than 4 hours waiting in A&E departments - from arrival to admission, transfer or discharge - other than in exceptional circumstances."

NHS Plan for England

Blueberry Consultants Ltd
Unit T1, The Arch
48-52 Floodgate Street
Birmingham B5 5SL
United Kingdom

Web: www.bbconsult.co.uk
Tel: +44 (0)121 285 0100
Fax: +44 (0)121 772 3103



The screenshot shows the Klok Triage system interface. At the top, there are navigation tabs: Whiteboard, Desktop, Reports, Admin, and About Klok. Below these are sub-tabs: Triage, Pediatrics, Major, Streamline, CADMU, X-Ray, Med Records, and All Dept. The main content area is titled 'Triage' and displays patient statistics: Patients: In Dept: 5, Since midnight: 0, Breached: 0, Not Breached: 0%. Below the statistics is a table of patient data with columns: Name, Time, Doctor / Seen, Ray, XRay, DTA, Speciality, Referral, Arrival, HndRec, and Dept. The table contains four rows of patient data, each with a colored background (black, pink, yellow, green) and a comment field.

Name	Time	Doctor / Seen	Ray	XRay	DTA	Speciality	Referral	Arrival	HndRec	Dept.
Davies, John	6:02		WR	WR	13:06	Surgeons	13:07	14:19	Requested	Triage
Smith, Mike	5:02	Mr Longnameish	WR	WR	13:06		13:07	14:19	Requested	Triage
Smith, Mike	4:02	Mr Brown	WR	WR	13:06		13:07	14:19	Requested	Triage
Jones, Mike	3:02		WR	WR	13:06		13:07	14:19	Requested	Triage

"Initially it was felt that staff would continue to use a whiteboard and that this was a management only tool - but staff very quickly realised that Klok made the old manual whiteboard a thing of the past!"

Teri-ann Grange
I.T. Projects Manager

or have access to medical assessment units (MAUs) to speed up the process of investigation and assessment of patients. Other A&E departments are concentrating on improving access to diagnostic facilities and equipment, or improving pre-admission and assessment processes, or building up better information on why and where bottlenecks are occurring.

Key to all these measures is ensuring that patients waiting times are properly monitored to avoid breaching the 4 hour window.

The Challenge

Teri-ann Grange, who works for the East & North Hertfordshire NHS Trust as its I.T. Projects Manager, needed a way to monitor and reduce the incidence of breaches to the 4-hour waiting limit in its A&E departments.

The Trust had previously been recording patient information on a whiteboard to monitor the amount of time patients spent in A&E for assessment, treatment or a medical decision.

Ideally, Teri wanted a new patient

monitoring system which would render breaches less likely. If successfully implemented, Teri-ann planned to roll out the system to the A&E department at Lister Hospital - and once proven stable, into further A&E departments in Lister and on to the Queen Elizabeth II in Welwyn Garden City.

Called Klok, the project was put out to tender and won by Blueberry Consultants.

The Solution

Blueberry Consultants designed and completed the Klok system in 4 months, using a combination of VB, ASP, IIS, MS and SQL Server technologies.

Klok uses a "traffic light system" of green - yellow - red - black colour coding to determine how long a patient has been waiting, and consists of:

1. [An interface to the Patients Administration System \(PAS\).](#)
 - * This interface can accept data from the PAS and automatically stores it in the Klok patient database.
2. [A Klok patient database.](#)

- * Patient details from the PAS are stored in this database along with subsequent comments and modifications by the A&E staff.

exceeded the 4 hour wait time and a summary of the doctor's workload.

3. [An interface for the A&E staff which is via a website.](#)

- * The website provides five main features:
 - A "Whiteboard" display showing all the patients in the department along with details such as name, time arrived, doctor etc. A colour coded 'traffic-light' display is used so that staff can quickly identify how long each patient has been waiting and if breach is likely.
 - A "Desktop" display which is used to edit patient details and to transfer patients between areas within the A&E department.
 - A "Medical Records" feature which is used to automate the requests for patients' medical details.
 - Administration screens which are used to define system parameters such as doctors names, department names, user logins etc.
 - A reports area which allows a user to generate reports on the number of patients who

Teri-ann Grange said: "The new Klok system allows staff to monitor the A&E department in real time, and to review and change any procedures that lead to breaches of the 4-hour rule. It also allows staff to track patients as they are moved around the hospital.

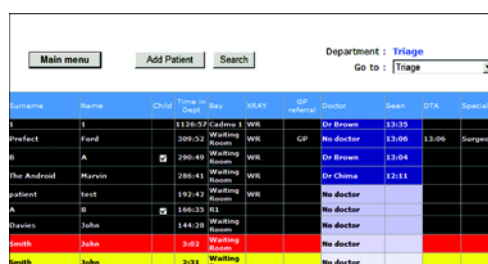
"As a management tool, it is easily viewed by general managers and other senior staff, which helps them manage their departments performance.

"Now that the Klok system has been operational for some time at the Lister and QEII hospitals, the benefits are really starting to emerge. It's reduced the incidence of breach, and despite some initial reservations from staff who felt that this was a management-only tool, and that they would prefer to continue using the whiteboard, staff very quickly realised that Klok made the old manual whiteboard a thing of the past. In fact, the staff who originally resisted the system now threaten death if it goes offline!"

"The staff who originally resisted the system now threaten death if it goes offline..."

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"The features seen as most useful by our A&E staff is the 'white' display indicating the allocation of a doctor or clinician



Surname	Name	Clinic	Time of Day	Bay	XRAY	GP referral	Doctor	Seen	OTA	Specialty
			11:26:57	Cardiac 1	WR		Dr Brown	13:35		
Prefect	Ford		289:52	Waiting Room	WR	GP	No doctor	13:06	13:06	Surgeons
B	A		290:49	Waiting Room	WR		Dr Brown	13:04		
De Andread	Marvin		286:41	Waiting Room	WR		Dr Chena	12:11		
patient	test		192:43	Waiting Room	WR		No doctor			
A	B		196:33	R1	WR		No doctor			
Davies	John		144:28	Waiting Room			No doctor			
Smith	John		3:03	Waiting Room			No doctor			
Smith	John		2:31	Waiting Room			No doctor			

Select Start Date Select End Date

< March 2007 >

M	T	W	T	F	S	S
26	27	28	1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	1
2	3	4	5	6	7	8

< March 2007 >

M	T	W	T	F	S	S
26	27	28	1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	1
2	3	4	5	6	7	8

Triage
 Streaming
 Paediatrics
 CADMU
 Majors

to a patient, and their accompanying medical notes.

"The 'traffic light system' of green - yellow - red - black colour coding, to show how long a patient has been waiting takes out all the guesswork, making the system fool-proof.

"Patient care has been significantly improved because the Klok system shows requests for x-rays and medical records. Because the bed managers can also see the Klok system, the process of requesting and allocating beds has become more efficient.

"Incorporating actual Bed Management information and Medical Record Reports into the Klok system is a pending development, but seen as invaluable to our A&E staff."

"To help integrate the system into our working practices, we've extended our equipment to include satellite PCs on trolleys, as well as large VDU screens."

The system can also be used by other display devices, such as PDAs and mobile devices.

John Davies, Software Designer for Blueberry Consultants, said: "We believe Klok helps in the delivery of better, safer care to patients, because it supports the changing infrastructure of the

NHS, which is gearing up to deliver accurate information through I.T. and its 'Connecting for Health' initiative.

"CfH came into operation in April 2005 and is an agency of the Department of Health, whose vision for the future is to have a more modern, efficient, patient-led health service and to give patients more choice and control over their own health and care by bringing in new computer systems and services. Klok is a perfect example of CfH in action."

Martin Green, Managing Director of Blueberry, said: "Blueberry is very pleased to be involved in this project. The Klok system has become invaluable at the Lister and QEII hospitals as a tool to help keep waiting times within Government guidelines, and we now have the opportunity to supply this tested and proven system to other A&E departments throughout the country."

If you would like to see Klok in action, the East and North Hertfordshire NHS Trust is happy to show interested parties the live system. Alternatively, Blueberry also has a test system online, which can be accessed via a login that can be provided on request.

For further details, please contact John Davies, Senior Software Designer, for Blueberry Consultants Ltd:

**john.d@bbconsult.co.uk
Tel: 0121 285 0100**

Klok desktop - Update Patient Details

Patient details		Status details	
A&E Number	<input type="text"/>	Dr/EMP	<input type="text" value="Dr Green"/>
First name	<input type="text" value="John"/>	Presenting Complaint	<input type="text" value="Chest Pain"/>
Surname	<input type="text" value="Smith"/>	Current Location	<input type="text"/>
Date of birth	<input type="text" value="01/01/1960"/>	Severity	<input type="text" value="4"/>
Gender	<input type="text" value="Male"/>	Bay	<input type="text" value="Pass 2"/>
Nationality	<input type="text"/>	Start Time	<input type="text" value="05/04/2007 09:40"/>
Religion	<input type="text"/>	End Time	<input type="text"/>
GP Referral	<input type="checkbox"/>	Results	<input type="checkbox"/> Reported <input type="checkbox"/> Notified
Hospital Number	<input type="text"/>	Seen time	<input type="text"/>
Case Note Enquiry	<input type="text"/>	Decision to admit	<input type="checkbox"/>
Comments on whiteboard	<input type="text"/>	DTA Time	<input type="text"/>
Notes	<input type="text"/>	No Answer	<input type="text"/>
		NLB	<input type="text"/>
		Referral To	<input type="text"/>
		Referral Time	<input type="text"/>

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