Accelerating chest pain triage

Streamlined workflow improves patient care

Who/where
University Hospital Aachen
Location: Aachen, Germany
Type: Tertiary medical center and research hospital
Beds: 1,360
Serves: 500,000 population; admits about 42,000 patients per year
Chest Pain Clinic: 5,000 patients per year
Catheterization labs: 4
H.P. Kühl, MD, interventional cardiologist

Challenge
Processing patients admitted with chest pain as quickly and efficiently as possible so that emergency cases are distinguished from less urgent ailments.

Solution
By having a Philips Achieva Cardiac MR, Philips Allura Xper FD X-ray and a Philips iE33 echocardiography system in the same room, workflow has been greatly improved. Patients who require immediate treatment can be helped without delay; others are discharged quicker.

As the incidence of ischemic heart disease rises, many healthcare institutions are struggling to effectively diagnose and manage the growing number of patients with chest pain symptoms. The University Hospital in Aachen, Germany has integrated various Philips modalities to create a much more streamlined workflow in its Chest Pain Clinic. The result is that the time taken to effectively diagnose suspected cases of ischemic heart disease may be significantly reduced.

"This gives us a big medical advantage".

The hospital's approach addresses two clear clinical needs, improving patient care and reducing costs for chest pain patients. For both issues the logical partner was Philips, because there is a long-standing partnership between the two for developing innovative clinical concepts. In this case, the solution included a specially-designed Philips patient table as well as different modalities - MR and X-ray - in one room.

A clear clinical need

The University Hospital Aachen is a tertiary care center and university research hospital that serves a patient population of about 500,000. It has a special Chest Pain Clinic that sees 5,000 patients per year. Over 50 percent are admitted to the hospital for further evaluation. In peak periods, 12 to 15 patients or more may visit the clinic each day.

H.P. Kühl, MD, interventional cardiologist

Dr. H.P. Kühl, interventional cardiologist, explains the hospital's clinical needs; "There is a relatively large burden of cost because chest pain is so common and the prevalence of ischemic heart disease is so high in the general population. You don't want to miss patients who have coronary artery disease and need medical treatment. On the other hand you wouldn't like to put patients in the chest pain ward unnecessarily and keep them waiting there for hours until acute coronary syndrome has been ruled out."

Current chest pain workflow

In the hospital's current workflow, a patient that comes in with acute severe chest pain is

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given an ECG. If the ECG shows typical ST-elevations compatible with acute myocardial infarction, patients are immediately sent to the catheterization (cath) lab without further delay. In case the ECG is unspecific, the focus is on ruling out the other life threatening diseases as quickly as possible. Amongst others there are pulmonary embolism, aortic dissection and acute coronary syndrome that are not a ST-segment elevation myocardial infarction (STEMI). Kühl explains the steps. "To diagnose acute pulmonary embolism we immediately perform a transthoracic echo to see if there is an enlarged right ventricle. An echo machine should definitely be available in the emergency room when there is ongoing suspicion despite a negative echo examination.

"I think there are a lot of time savings and workflow improvements in the new workflow".

CT scanning would be the next step. In case of suspected aortic dissection we would immediately perform a CT scan. To rule out acute coronary syndrome, including non ST-segment myocardial infarction, a more gradual approach is applied. Apart from giving repeated ECGs, blood samples are taken and troponin and CK levels are analysed every three to four hours to rule out non ST-segment myocardial infarction. In addition, an echo is performed to look for regional wall motion abnormalities."

Kühl says, "We have to risk stratify patients with acute chest pain and imaging is a very important part in the triage of the patient in order to rule out severe cardiovascular disease. You would like to securely identify those patients who can be safely sent home and those who need to be admitted to the ward for further diagnostic work-up and treatment." Finding an efficient way to risk stratify cardiac patients was the main goal of the hospital's new imaging set-up.

New hybrid workflow

The new workflow has a Philips Achieva 1.5 Tesla Cardiac MR, Philips Allura Xper FD 20/10 biplane X-ray and Philips iE33 echocardiography system with a 3D TEE probe in the same room. It shares a specially designed patient table that swings away from the MR or X-ray system and places the patient in the same position for angiography and for MR examinations, so they do not have to be turned between exams. The room is divided by sliding walls.

Kühl says, "This gives us a big medical advantage. Patients who are diagnosed and need immediate treatment can be moved immediately from the MR to the angio system, where they can be treated without delay. For instance, if a patient has coronary artery disease, we can put a stent in right away."

Having the MR and angio systems next to each other works the other way around as well. When the team performs a catheterization procedure and sees a stenosis, they don't know if it is clinically significant or not. Or they may have a large scar or a wall motion abnormality which is visualized by angiography. What do they do? Before, they used to take the patient off the table and ask for an MR study. And this was scheduled for three days later, because the MR time-schedule in the radiology department was fully booked. Now patients can be moved directly from one imaging modality to the other without any time delay. "I think there are a lot of time savings and workflow improvements in the new workflow. This may be a big advantage of using such a system," says Kühl.

Help speed diagnosis for non-STEMI patients

Patients who are candidates for the new hybrid workflow are acute chest pain patients with inconclusive ECG in the early phase of the diagnostic work-up including negative first troponin test. The patient has experienced chest pain symptoms, but these symptoms have gone away sometime after arriving at the Clinic. Kühl believes that much of the diagnostic workflow can be done with MR imaging. This will help us better stratify the patients."
He adds, "By using this system and by ruling out severe coronary disease very rapidly, say within the first two to three hours, we can save a lot of time and send those patients which have no cardiac disease safely home without admitting them to the hospital. That could also be an important cost saving for healthcare providers."

"This will help us better stratify the patients."

Challenging project

The planning for the new set-up took about six months. One of the big challenges was the building itself. The hybrid suite is located on an upper floor of the hospital and getting

The hybrid system: a Philips Achieva 1.5 Tesla Cardiac MR, Philips Allura Xper FD 20/10 biplane X-ray and Philips iE33 echocardiography system with a 3D TEE probe all in one room

the MR scanner and all of the other equipment to this location required a great deal of planning. The patient table was also something new for all parties involved.

"We were quite happy with all of the solutions and how it has been done."

Kühl says, "Philips already had a solution for the table, you had to turn the patients around 180 degrees so the head was on one side for the angio system and for the MR you needed it on the other side. That meant you had to turn the patient around and we wanted to avoid that. If you have a patient that is anesthetized and you need to turn them around with all the cables and tubes, it can be quite difficult. So we needed to have the table in the same position for angio and for MR." The solution was a sliding table that first moves out of the imaging plane and then slides to the side and over to the other system. This is a new concept that was developed especially for the University Hospital Aachen site.

"I think the cooperation was quite good. In the end we were quite happy with all of the solutions and how it has been done," says Kühl. The new set-up became operational in January 2009. The hospital is planning several studies to evaluate the benefits of the new workflow. One study in particular will be looking at identifying the best predictors for severe coronary artery disease.

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