



# The High-End Solution for Real-Time Patient Tracking

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You trust your planning and delivery systems to constantly achieve the best possible results.

Now you can trust the Catalyst™ to provide the same level of confidence for the only remaining variable – your patient.



# Catalyst™ Clinical Benefits



- Correct posture and setup at every fraction
- Maintained positioning accuracy during the whole delivery
- Sparing of healthy tissue through respiratory gating

# Setup and Positioning

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While IGRT systems are used for final positioning, body tattoos and room lasers are typically used for initial setup, meaning that only three points on the skin surface are the basis for setting up the whole patient. Correcting a setup error means that the patient position must be shifted manually, followed by an additional check for laser and tattoo alignment. It is typically not possible to detect posture errors or misalignment of patient extremities with a classic "3 point set up".

Catalyst™ captures the complete body surface continuously. The Non-Rigid Registration Algorithm compares the current patient posture to the previously recorded reference setup in real time. Deviations are immediately projected directly onto the patient's skin, ensuring a fully interactive work flow. Catalyst™ communicates directly with the couch to support the auto set-up procedure. The system is designed for a maximum level of integration into the treatment process.



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# Intra-Fraction Motion Detection



**“Any movements outside of clinician set tolerances will trigger an optical and acoustical alarm and optionally interrupt the beam until the patient is again within tolerance.”**

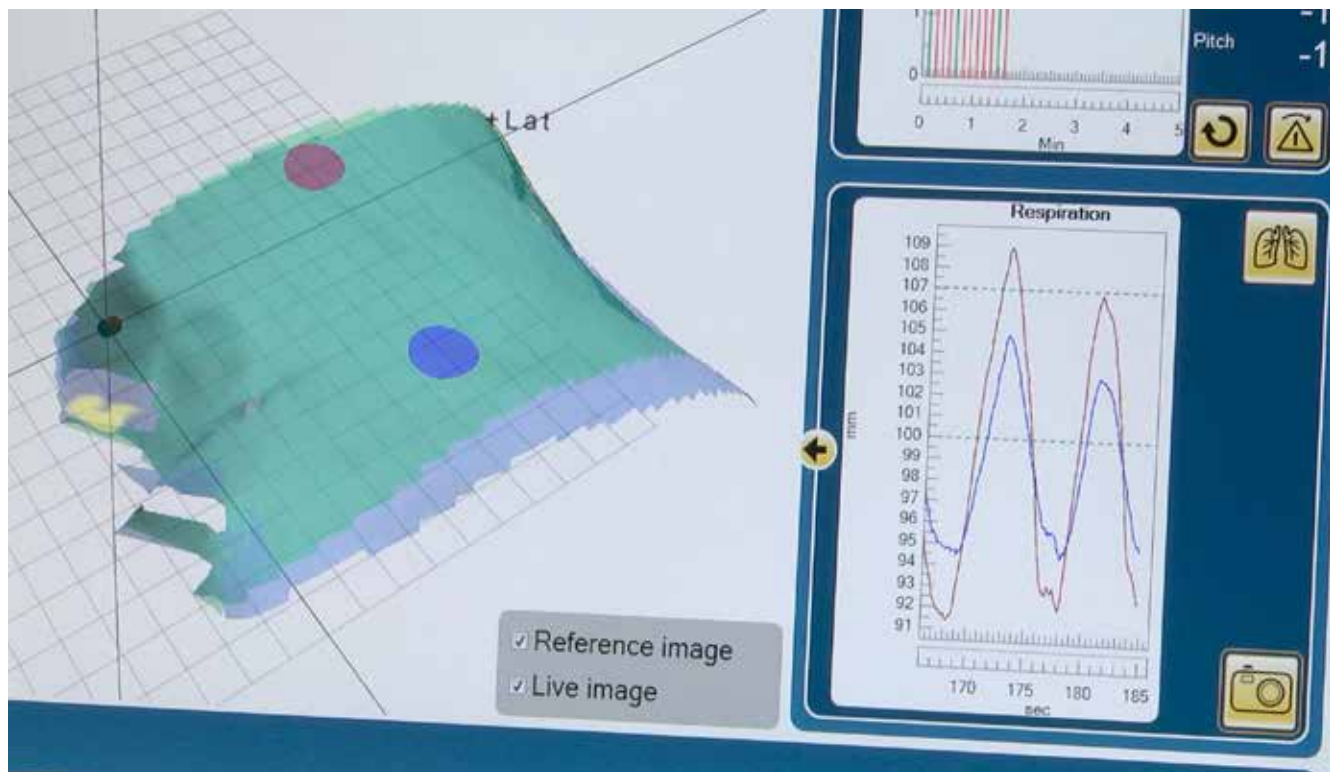
After the precise positioning of the tumor it is essential to ensure the accuracy of delivery over the entire treatment course. The continuous monitoring of the patient while treatment is in progress prevents clinically significant movements from occurring. Treating with small margins requires the same accuracy in initial positioning and monitoring. Although using in-room video cameras connected to TV monitors in the control area help to detect large patient movements, it requires the full attention of the treating therapists and smaller movements may be missed.

Catalyst™ continuously monitors the patient during the entire course of treatment. Patient templates ensure the optimal setting for individual treatments. Any movements outside of clinician set tolerances will trigger an optical and acoustical alarm and optionally interrupt the beam until the patient is again within tolerance. Alternatively the position can be corrected with the Catalyst™ positioning module.

Catalyst™ ensures continuous, accurate monitoring from initial positioning to the delivery of the last field.



# Respiratory Gating



Respiratory gated treatments are focusing on tumor indications where the target or sensitive tissue moves with the respiration cycle. Thoracic-abdominal cases, specifically breast treatments, benefit from the Catalyst™ gating solution. Visualizing the respiratory pattern and direct beam control simplifies the therapist's workflow, provides confidence, and increases patient comfort.

The Catalyst™ gating solution requires no markers or fiducials on the patient's skin. The operator defines multiple virtual markers which are tracked over the complete treatment course. All measurements are performed in absolute room coordinates, alerting the operator to all externally detectable baseline shifts instantly. The innovative audio visual feedback system opens the possibility for the patient to actively contribute to the quality of the treatment. Catalyst™ supports all gated treatment techniques such as deep-inspiration breath-hold, free breathing and coached breathing.

In combination with the C-RAD Sentinel™ System, Catalyst™ offers coverage for the whole chain from gated imaging to gated beam delivery.



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# Showcase: Breast Patients

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Breast treatments represent 25% of all cases treated with radiation therapy. The close proximity of the target volume to sensitive organs along with significant respiratory-induced movements presents some unique challenges that are difficult to handle using only conventional IGRT methods.

Specifically, the positioning of the arms is known to have an influence on the treatment volume(1). However, the arms are outside of the field of view and therefore not possible to visualize using the commonly employed IGRT system such as CBCT, orthogonal kV or EPID.

Catalyst™ offers a complete solution for online patient tracking before and during treatment delivery, thus ensuring the best possible treatment outcome without non-prescribed dose.

<sup>1</sup> A pilot study of breast cancer patient positioning using optical surface scanning and reprojection. Mattias Jönsson et al. Lund University 2012.

## Setup and Positioning

During setup, the Catalyst™ system provides true interactive visual guidance by projecting information regarding the required adjustments directly onto the patient's skin.

This ensures that any significant posture and positioning errors are eliminated early in the process, while these are still easy to correct.

## Motion detection

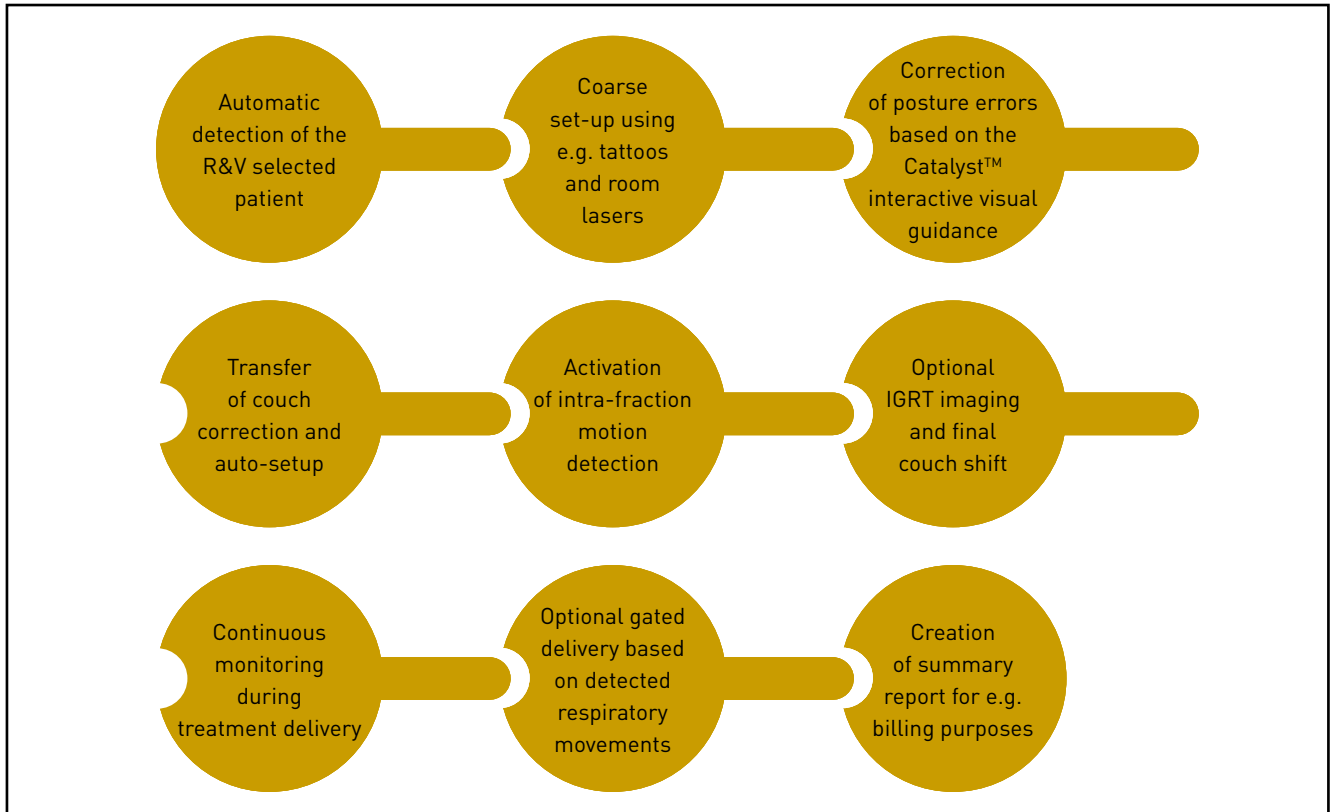
Once initial setup is completed, the Catalyst™ system will continue to monitor the patient's posture and position during treatment. Large patient movements will immediately trigger an alarm and/or beam hold.

The Catalyst™ system is also continuously calculating the isocentric shift, which enables the detection of slower movements such as the patient relaxing or gradually sliding out of position. These deviations are typically not possible to detect using only the conventional room camera systems.

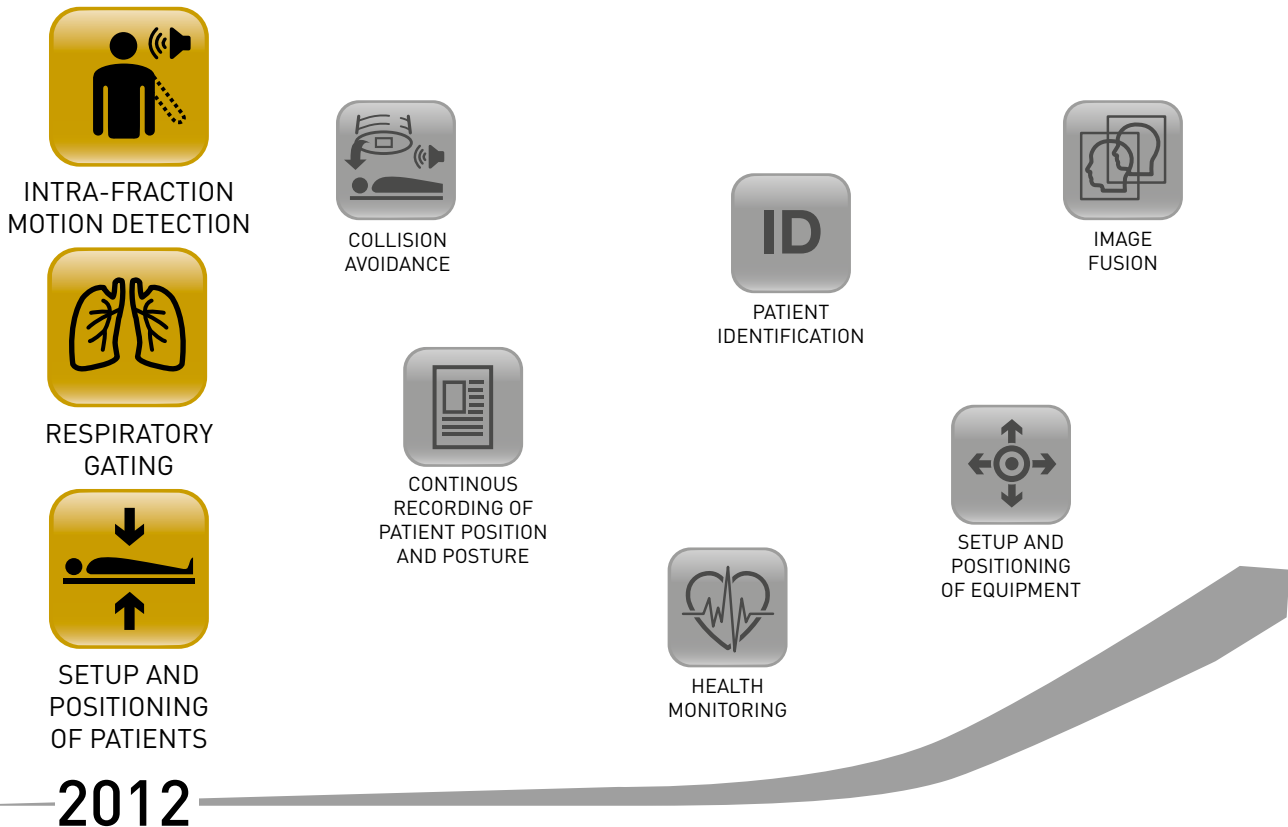
## Respiratory gating

For left sided breast treatments, respiratory gating is a proven method for minimizing the dose delivered to the heart muscle while maximizing the dose to the treatment volume. In contrast with most other gating systems, the Catalyst™ system will monitor the respiratory motion without requiring any markers or fiducials to be placed on the patient. General patient motion is also monitored in parallel, thus ensuring maximum patient safety.

# Workflow



# Developments and Future Plans



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