

Philips Healthcare Informatics Strategy

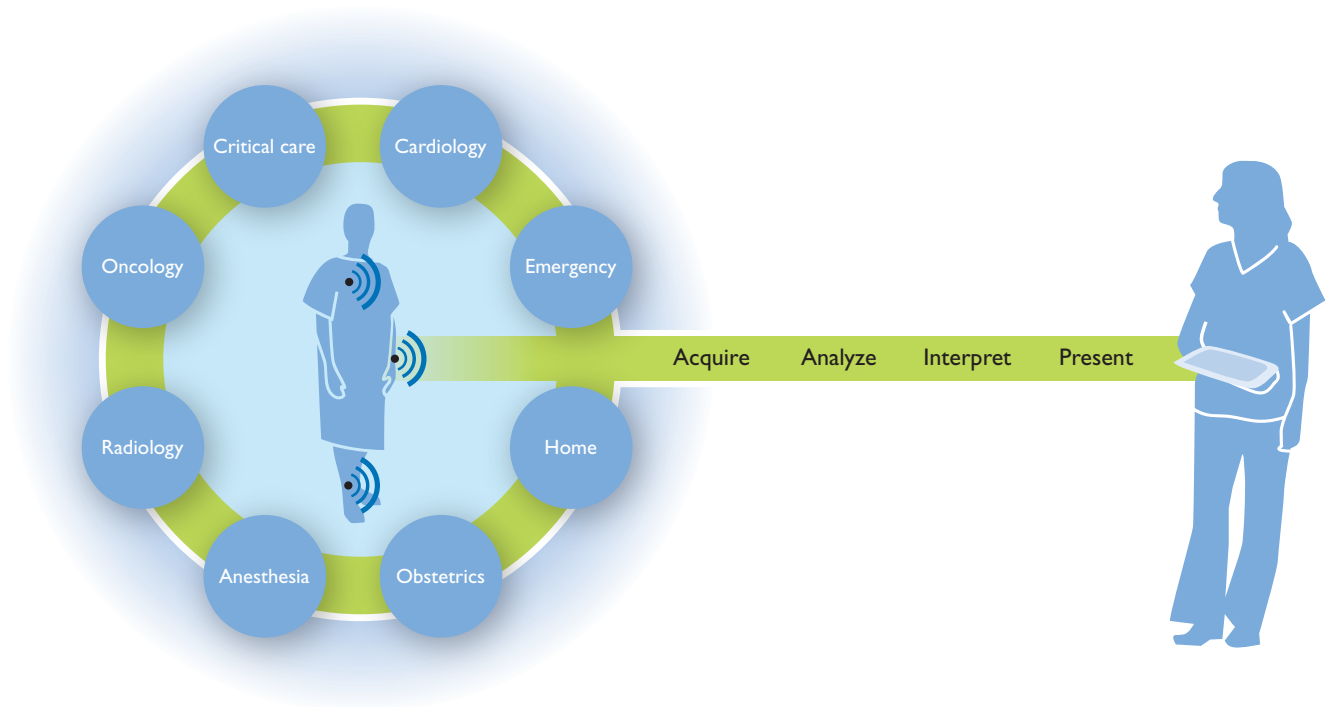
We provide clinical informatics and patient care solutions that simplify clinician workflow, improve financial outcomes, and help improve and save lives.

The three elements of Philips Healthcare's informatics strategy are principal themes in healthcare delivery today. Clinicians around the world are looking for solutions to simplify workflow, improve financial outcomes, and improve and save lives.

Philips delivers clinical informatics and patient care solutions that acquire, analyze, interpret, and present patient data in ways that are meaningful for clinicians in

the most challenging and data-rich areas of the hospital, including critical care, cardiology, emergency units, obstetrics, anesthesia care, radiology, oncology, and general/acute care, and also in the home.

Because our best-in-class systems acquire data, we can do something fundamentally smart with it: We can analyze (combine volumes of data to determine relevant features), interpret (show relationships compared to historical data, and give greater meaning and context), and present (deliver when, where, and how it's most useful) information to support clinical decision making, anytime and anywhere. (appendix A).



Acquisition starts with the patient. And because we acquire data from patients every day all over the world, we amass data repositories that we then use for computer modeling, statistical analysis, and to build rules-driven, outcomes/evidence-based tools.

For example:

- Because we collect hundreds of thousands of ECGs, we can analyze heart rhythms and create predictive algorithms tailored to gender, race, and age
- Because we have banks of thousands of lung images, scanned, bar-coded, and registered, we can create lung models for computer-aided diagnosis (CAD) of lung disease
- Because we have monitoring and laboratory information on over one million ICU patients, we can transform the data into algorithms that help predict and treat sepsis and related adverse events

These actions – acquire, analyze, interpret, and present – are the foundation for clinical decision support and enable Philips to provide administrators, clinicians, and patients with clinical knowledge that is intelligently filtered and presented at appropriate times to enhance the quality of care and improve financial outcomes. (appendix B).

Clinical decision support solutions will be delivered via a unique, unifying architecture that has a common infrastructure and specialized platforms for imaging and patient care decision support. Platform qualities include:

- Interface with EMRs and EHRs and core HIS, and complement these investments (appendix C)
 - Currently 70% of all patient monitoring orders in the US include HL7 interfaces
- Interface clinical and business data from Philips systems and non-Philips systems
 - Outcomes reports from VISICU® that benchmark severity-adjusted mortality and length of stay performance using industry-standard APACHE® methodology
- Ensure only authorized users can access the system to guarantee patient privacy
 - PII Authentication, Authorization and User Management (A & A) components
- Can be serviced remotely and pro-actively (trouble shooting before the problem occurs)
 - Available through iSite ‘Heartbeat’ capabilities and service model

- Allow for instant collaboration among clinicians throughout care cycles
 - Instant messaging capabilities among radiologists within iSite, and seamless integration with enterprise-class collaboration software such as Microsoft’s or Cisco’s Unified Communication solutions
- Familiar, intuitive user interface for an iPhone generation of caregivers
 - Information design as part of Philips brand identity with meticulously developed context-driven patient and user experience; a focus of Philips Design and the User Interface Competency Center

As definitions of “certified EHRs” take shape under the American Recovery and Reinvestment Act, Philips will ensure our current or refined solutions support certification, adoption, and “meaningful use.” There is a fundamental distinction between (1) EMRs, EHRs, and HIS and (2) Philips informatics solutions:

1. EMRs, EHRs, and HIS focus on business-related functionality such as billing, reimbursement, and data storage. They are not regulated (e.g., by the FDA) to ensure healthcare quality compliance.
2. Philips clinical informatics and patient care solutions integrate and interoperate with EMRs, EHRs, and HIS – and complement customers’ investments in these systems. Our clinical systems are FDA regulated because the systems deliver actionable and, in many cases, real-time clinical information that has been rigorously tested to ensure clinical trustworthiness.

We will continue to focus on providing the embedded clinical decision support to help US-based care givers capitalize on the \$17 billion in physician and hospital incentives to invest in the adoption and use of health IT.

Philips Healthcare informatics strategy is centered around clinical decision support that simplifies clinician workflow, improves financial outcomes, and helps improve and save lives. We are focused on delivering this via a unifying architecture that integrates into the EMR and HIS.

The following are current examples of how Philips Healthcare's is making a difference in the lives of patients, their families, and care providers with clinical decision support:

Simplify clinician workflow

- At Banner Health (a multi-US-state nonprofit), glucose workflow reminders contributed to constant dialog between the eICU® center and the Units, resulting in increased compliance from 20% to 60% of patients whose levels were kept within target range
- Carolinas Medical Center (a 874-bed hospital in Charlotte, North Carolina) tracked a 25% workflow improvement in radiology cases – from reviewing 300,000 cases to 1.2 million cases per year – which contributed to both workflow and financial improvement
- Waterford Regional Hospital, Ireland, embedded CVIS in work instructions, which clarified responsibilities and significantly increased the number of cath patients seen. Implementing 24-hour blood pressure and Holter interfaces enabled authorized users to view results anywhere in the hospital.
- Kettering Health Network's iSite PACS enabled users to read studies faster, from practically anywhere in the network, and improved workflow efficiency in a CT imaging study for ED patients providing turnaround from exam to final report in as little as 15 minutes, (vs 2-3 hours).
- Inland Imaging increased radiology reading studies per month from 15,000 to 1.2 million in six years.
- Kaiser Permanente Health System effectively manages three million studies a year over 38 sites using iSite PACS.

Improve financial outcomes.

- Resurrection Health Care (a Chicago-based not-for-profit organization) reported a 38% severity-adjusted length of stay reduction, 41% severity-adjusted mortality reduction, and \$5-6 million in preventable claims settlements within six months of implementing an eICU Program
- Avera Health (a multi-state HMO) implemented eICU Program in 16 facilities across four states; through remote monitoring, an estimated 37.5% fewer rural health patients required transfer, which represented a cost savings of more than \$1.2 million, and they reported an additional \$8 million savings for aggregate length of stay reductions
- UMass Memorial Medical Center (University of Massachusetts) reported an average cost savings of \$5,000 per patient associated with the implementation of the eICU® Program through reducing average hospital length of stay by four days and the ability to discharge patients to their homes rather than to a post-acute facility and it was estimated that 309 lives were saved in one year alone

- University of Wisconsin reported an increase in annualized professional fee billings for critical care services of more than 30% associated with use of eCareManager documentation
- CVIS helped reduce coding errors at Great Ormond Street Hospital, London, UK, saving an estimated £500,000 (or more) in one year. The ability to cross check business data potentially yields even greater savings.
- MD Anderson Cancer Center estimates they'll save \$30 million over 8 years through the use of iSite PACS.
- Christiana Care Health System quoted the nearly 40% reduction in turn around time as a direct result of radiologists' ability to access iSite Radiology and read cases from the work list regardless of where the exam was performed. Within eight weeks of going live they reduced turn around time from 20 hours to 12 hours, and cut film costs by 95% for a \$500,000 cost savings.

Help improve and save lives

- At the University of Chicago, we applied 2,000 rules engines (that check physicians' reports for clinical accuracy and integrity like spell checker) to 90,000 echo reports, which identified clinical discrepancies in 20% of the cases – findings that contribute to reduced medical errors and improved care
- At Concord Hospital (New England), a 74-patient study showed the use of Horizon Trends and ST Map improved blood pressure management for patients on vasoactive medications; 81% of the time, patient blood pressure was kept within the desired limits using the applications versus 64% without
- At Legacy Health (Portland, Oregon-based hospital system) and St Vincent's (Bridgeport, Connecticut) in a 135-patient study, septic patients monitored with Protocol Watch had a significant decrease (from 182 to 112 minute) in the amount of time it took to administer antibiotic therapy – in a patient population where time is critical
- Provena Health (multi-facility, Indiana and Illinois-based facilities) saved 55 more patients by using the eICU Program to increase compliance to the Surviving Sepsis Campaign sepsis bundle during their trial

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Appendix A: Clinical decision support (current and future) by clinical segment

| | Acquire | Analyze | Interpret | Present |
|--------------------------------------|---|--|--|---|
| Philips strategy fundamentals | <p>We collect data (such as heart rate, respiration, SpO₂) from individual patients via our monitors, telemetry, information systems, imaging systems, and other patient care solutions.</p> <p>We collect data on millions of patients and use the information for computer modeling and statistical analysis to develop new algorithms, alerts, and bring to market highly differentiated software applications and outcomes/ evidence-based tools more rapidly than our competition.</p> | <p>Our systems determine the essential, relevant features from among high volumes of historical data.</p> | <p>Using embedded mathematical algorithms, and evidence-based databases, Philips systems give the data greater meaning – either in context of other patients’ data (a statistical, relational database), or juxtaposed with other data points on that person (relationships, patterns among data elements from a body of evidence).</p> | <p>Philips systems deliver clinical information how, when, and where clinicians need it, in ways that make it most useful for clinical decision-making.</p> |
| Critical care | <p>Monitoring and imaging devices acquire patient’s vital signs, CT, MR, nuclear medicine, data.</p> | <p>Protocol Watch analyzes the set of information to help indicate when septic patients require antibiotics, and helps caregivers administer antibiotics sooner if needed (vs. those without the application).</p> | <p>Through the eICU Program, we compare vital sign and lab data on this patient against data in a one million-ICU-patient database.</p> | <p>We provide an integrated clinical view of the patient, with multi-modality reporting, advanced event surveillance, arrhythmia detection to any device or location, checklists and documentation on compliance with protocols, and workflow status reporting.</p> |
| Cardiac care | <p>ECG (telemetry), Echo, cath lab information collected on the patient.</p> | <p>Advanced algorithms and quantification offer specificity on age, race, gender, calcium scoring, regional wall motion.</p> | <p>Executable guides for MI and stroke support a multi-patient, multi-clinician approach with built in intelligent differential diagnosis.</p> | <p>Rules engines check physicians’ reports for clinical integrity like a spell checker. A study at the University of Chicago applied 2000 rules to 90,000 echo reports and found 20% had clinical discrepancies.</p> |
| Digital pathology | <p>ID tissue sample taken and bar coded in clinic, pathology laboratory workflow activities registered, grossing of samples photographed, tissue slides scanned.</p> | <p>Workflow data is organized with a patient-centric PACS, computer-aided detection tool determines morphology characteristics and immunohisto-chemistry quantification, expert consulting.</p> | <p>Clinical decision support offered through database queries and by overlaying multiple images of same sample, grading (e.g. breast cancer), correlating tissue data, clinical chemistry, molecular data.</p> | <p>Multi-modality reporting capabilities illuminate information that’s otherwise would be segmented by medical specialty; displayed in comprehensive context for tumor boards.</p> |
| Acute care | <p>Vital sign monitors and small, sensors acquire physiologic information.</p> | <p>Trending and predictive algorithms for respiration, heart rate, blood pressure.</p> | <p>Alerts and advisories, recommendations of intervention, early-warning scoring, treatment and diagnostic guidelines.</p> | <p>Smart Alert Prompts improve surveillance and reduced complications, which reduce hospital length of stay.</p> |
| Anesthesia care | <p>Anesthesia Machine and Integrated Anesthesia Workplace (including interfaces to Anesthesia Machine, patient monitors, and infusion pumps)</p> | <p>Data and settings from anesthesia machine, monitor, and infusion pumps</p> | <p>Algorithms for advisories and alerts, suggestions for settings of therapy devices, protocol and bundles guidance, assessment of treatment cost (time, drugs, gases, etc.)</p> | <p>Integrated “anesthesia cockpit” display with unified user interface to present patient and device information and control monitor and therapy devices; semi-closed loop control of anesthetic gases and drugs</p> |

Appendix B: Various, current characterizations of clinical decision support

| | |
|--|--|
| <p>Philips Healthcare Clinical Decision Support innovation theme</p> | <p>The ability to “Provide administrators, clinicians, and patients with clinical knowledge that is intelligently filtered and presented at appropriate times to enhance the quality of care and improve financial outcomes.”</p> |
| <p>Healthcare Information Management Systems Society (HIMSS)</p> | <p>Broadly defined as “A clinical system, application or process that helps health professionals make clinical decisions to enhance patient care. Clinical knowledge of interest could range from simple facts and relationships to best practices for managing patients with specific disease states, new medical knowledge from clinical research and other types of information.”</p> |
| <p>David Blumenthal, M.D., M.P.P. As it relates to the American Recovery and Reinvestment Act, New England Journal of Medicine, 9 April 2009</p> | <p>“If EHRs are to catalyze quality improvement and cost-control, physicians and hospitals will have to use them effectively. That means taking advantage of embedded clinical decision supports that help physicians take better care of their patients.”</p> |

Appendix C: Definitions of HIS, EMRs, EHRs, and PHRs

Philips Healthcare informatics systems acquire, analyze, interpret, and present information. Contrast this with these other systems, which store and transfer only the information that’s fed into them.

Hospital Information Systems (HIS): Hospital-wide administrative systems that include registration and laboratory information. Examples include offerings from Cerner, McKesson.

| | |
|---|---|
| | <p>An electronic record of health-related information on an individual that:</p> |
| <p>Electronic Medical Record (EMR)</p> | <p>can be created, gathered, managed, and consulted by authorized clinicians and staff within one healthcare organization.</p> |
| <p>Electronic Health Records (EHR)</p> | <p>conforms to nationally recognized interoperability standards and that can be created, managed, and consulted by authorized clinicians and staff across more than one healthcare organization.</p> |
| <p>Personal Health Records (PHR)</p> | <p>conforms to nationally recognized interoperability standards and that can be drawn from multiple sources while being managed, shared, and controlled by the individual.</p> |

Appendix D: How recent acquisitions bolster Philips informatics portfolio

History. Philips has been a medical technology pioneer, launching the first blood pressure monitoring device in 1917. We offered the first commercially available non-invasive fetal monitor and first cardiac arrhythmia monitor in the 1960s, and as early as 1979 we broke ground in the fledgling field of healthcare informatics with an anesthesia clinical information system.

Over the span of 30 years, we brought informatics solutions to market for critical care, obstetrics, cardiology, radiology, and oncology – all focused primarily on clinical (vs. business) information.

Recent informatics-based acquisitions have rounded our portfolio, and enabled us to deliver even greater clinical depth and transcend clinical department boundaries.

| Stentor | XIMIS | Tomcat | VISICU |
|---|--|---|---|
| iSite PACS. | XIRIS -- Xtended Internet Radiology Information System. | Cardiovascular Information System (CVIS). | eICU Program. |
| Enterprise imaging informatics solution delivers high-resolution diagnostic-quality images from X-rays or MRI, conveniently stores them, and enables convenient, quick access to large compressed files. | Web-based radiology workflow management system, and imaging department resource and activities/ productivity management informatics. | Comprehensive, patient-centric software system tracks and records patient cardiac data and addresses both cardiac-related clinical and operational needs such as scheduling, staff and resource management, and cost capture. | Remotely staffed informatics solution analyzes patient vital signs, medications, and labs, and prompts clinicians when thresholds are exceeded. |
| Enables faster diagnosis and more collaboration by digitizing images and speeding up processes for viewing, manipulating, and sharing. Fee-per-study business model makes PACS affordable for many hospitals. | Reduces errors and streamlines workflow. | Makes connections among cath lab workflow management systems and PACS. | Supplements staffing with dedicated intensivist resources and allows intervention to prevent or manage crisis in the ICU. |

Acquisitions factor prominently in our current and future clinical decision support capabilities, including:

| Time-critical procedure guidance | Diagnosis and treatment choices | Operations improvements and quality management |
|--|--|--|
| <ul style="list-style-type: none"> eICU and eHospital Programs (VISICU) Smart Alert® prompts (VISICU's eCareManager) Sepsis algorithms (eCareManager and ProtocolWatch) Weaning protocols ICIP Advisories | <ul style="list-style-type: none"> Complete cardiovascular information systems (CVIS) (Tomcat) Digital pathology (iSite) – future Closed-loop imaging (iSite) – future Cancer care companion clinical application – future | <ul style="list-style-type: none"> Data Analysis and Reporting (ICIP) Alarm tracking (Emergin) Digital pathology (iSite) Closed-loop imaging (iSite) Radiology workflow (Ximisi) Performance Benchmarking (VISICU) |

Emerging markets

Philips Healthcare is aggressively scaling up our presence in Brazil, Russia, India, and China with local acquisitions (i.e., Dixtal, Traxal, Goldway) that give us in-country development, manufacturing, and sales resources, and a 'value' product set that's tailored to the financial and care-delivery requirements of large and influential emerging markets.



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