Ascom - how we support healthcare organisations worldwide

Improving communication and collaboration

December 2020

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ascom

Ascom in Healthcare

You already know about the challenges facing the healthcare sector. You know about aging populations and budget constraints. You know about rising patient expectations. In addition, you probably know how hard it's becoming to attract and retain top-class employees.

You might even know that Ascom, for more than half a century, has been developing mobile communication solutions for the healthcare sector. We are constantly dedicating more and more resources and innovation to support the growing demands of the sector.

Are you aware about how those challenges may be impacted by a communication platform created specially for healthcare organisations?

Read on to discover how the Ascom Healthcare Platform can help you and your colleagues solve some pressing problems. Find out how we work in real, demanding healthcare environments. This document only scratches the surface of the full potential of the Ascom solutions.

Healthcare Challenges

Populations

Populations worldwide are rapidly aging, straining already limited resources. It is not only restricted to the world's most developed nations. Ageing populations and with this an increased number of chronically ill patients leads to demand for efficiency in all stages of the care chain. There is a great need for more efficient, highly coordinated care.

Digitzation

Digitization of healthcare is an important factor in meeting the ever-increasing need for resources. Ascom's solutions enable effective mobile working including improved communication between staff and patients.

A globalized economy

A globalized economy means disease outbreaks spread quickly, overwhelming national health systems. The growth of global trade and travel means, **"a localized epidemic can transform into a pandemic rapidly, with little time to prepare a public health response"**. Outbreaks can challenge even the most sophisticated international responses, as evidenced by the Covid-19 pandemic.

How do you protect patients from infections without isolating them and not risking the patient safety while taking the patient's wish for greater interaction and communication into account? Ascom's solutions provide smart communication between patient and staff that can help to reduce the number of trips in and out of the isolated area for the staff but also increase the service for the patient.

Workplace violence

Workplace violence is a constant issue for healthcare staff, affecting both staff and patients. The main challenge is that the violence against staff has not only a negative impact on the psychological and physical well-being of the staff, but also affects their job motivation.

Physical and verbal abuse against caregivers is widespread. That is why a personal alarm system is essential in today's healthcare sector.

Ascom staff protection solutions enable fast, accurate and coordinated responses to personal safety alerts. Such alarm notifications can even be sent should a member of staff lose consciousness or otherwise be unable to transmit an alert.

Patients and relatives

Patients and relatives become 'specialists' in their own disease because they have access to information. This not only raises expectations for high-quality care, it lets patients learn about their conditions and treatments, and makes it possible for

them to become more active members of the care team. Such collaboration can be hugely beneficial—provided there are communication systems in place that facilitate information sharing.

Ascom response systems enhance and personalize the communication flow between nurses and patients. This empowers patients by giving them more control over their immediate environment, and more information about their hospital stay to help achieve patient satisfaction.

Staff communication and collaboration

Poor communication is one of the biggest problems facing hospitals today. Ineffective communication can lead to many issues: improper diagnosis, delayed or improper treatment, patient insecurity and stress. Without proper communication, it is harder for care teams to be continuously up to date.

Ascom enable staff collaboration by providing role-based communication support, staff availability status and efficient means of collaborating around the patient with a mobile way of working.

Inadequate face time

Nursing shortages and administrative workloads mean nurses have less and less time to devote to each patient. This lack of ‘face-time’ can impact clinical outcomes and patient satisfaction levels.

Ascom provide point-of-care solutions that make it possible for caregivers to perform tasks and receive patient and clinical data while remaining with a patient at the point of care. Clinical data sources have traditionally been static. Ascom makes them as mobile as possible for the people who use them and provide added confidence that they can remain in close contact with them when they leave the patient room.

Alarm hazards and alarm fatigue

Alerts that do not reach the appropriate staff, or an excessive number of clinically insignificant alerts, can cause ‘alarm fatigue’. This can lead to staff missing important alerts, or deliberately disconnect equipment in order to gain a respite from unnecessary alarm notifications.

Ascom solutions help minimize clinically insignificant alerts. Alarm notifications are filtered, grouped and targeted only to assigned caregivers in pre-assigned escalation chains that supports a mobile way of working.

Discontinuous care

Patients stranded in wheelchairs, waiting for porters to wheel them to another ward or department; delays and misunderstandings at shift handovers; constant staff changes that make it difficult to create relationships between caregivers and patients. Discontinuous care can make a stay in hospital a frightening and disorienting experience—especially for the elderly and the mentally ill.

Ascom solutions help optimize patient pathways within and between departments. We provide hospitals with communication and workflow tools that are integrated to support a mobile way of working.

Inadequate management data

Information is power, and nowhere is it more powerful than in hospitals. The problem is how to collect, store and distribute huge amounts of data in ways that can yield valuable results.

Ascom solutions for data analysis can help hospital managers and administrators improve workflows, enhance patient safety and reduce costs. They can, for example, help managers or administrators investigate accidents and incidents. They can help customers track and analyze key performance data in order to identify and address inefficiencies.

Healthcare Trends

Patient Trends

Patient safety and satisfaction are key. This is due to a variety of factors such as the increasing awareness of the patient and relatives, the technical and economic development of society and the increased travel of people. For example:

- Patient satisfaction is reliant on providing a reliable, easily accessible, and user-friendly patient environment with short communication lines and personal interactions.
- Patient safety often focuses on single patient rooms for a calmer experience, protection from infections but still provide patient safety. This could be done with monitoring solutions both in care environments as well as at home.

Staff Trends

Staff empowerment and mobile working are key.

- Improving staff collaboration to limit issues like improper diagnosis, delayed or improper treatment, patient insecurity and stress. Nursing shortages and administrative workloads also means nurses have less and less time to devote to each patient.
- Improving communication between staff and patients helps to keep patients up to date and give staff the opportunity to provide a more precise service.
- Providing the right information at the point of care where the staff meet patients is also more and more important to limit the issues of improper diagnosis, delayed or improper treatment, patient insecurity and stress.

Technology Trends

Digital transformation and interoperability. Consolidation of hospital ICT systems, consolidation of hospital EMR systems, AI and Big Data analytics.

- Consolidation of hospitals' ICT systems demands enterprise-level software that can serve multi-site installations.
- More data is being captured and shared than ever before. Is this is a good thing when it comes to healthcare? Yes, because the more information healthcare providers have about us, the more accurately they can predict, and the more Big Data companies can start using this knowledge to predict when people will get sick.
- As quality data and consumer and patient trust increase, AI will become more reliable. It is possible that in future a computer can be more accurate in making a diagnosis and determining treatment.
- While trust in technology is rising, it will be dependent on the actions we as suppliers take to demonstrate integrity and put consumers at ease.
- Another clear trend is smartphone apps with a vendor neutral approach to mobiles devices and peripherals.
- We can also see more light-weight solutions where you can adapt the solution to the user's needs in a relatively simple way.

Solution Description

Employee Login
The employee logs on to a mobile device when arriving on shift.

Employee Availability
The employee becomes available for collaboration and notifications.

Employee Collaboration
The employees are able to collaborate with colleagues.

Employee Role Assignments
The employee becomes available for the actual role assignments.

Employee Notifications
The employees are available for all notifications based on role assignment.

Employee Views
The employees are allowed to access all relevant views for the actual roles assigned.

Employee Login and Availability

The Ascom platform is open, flexible and user-friendly and designed to support employees' workflows and manage the events they encounter every day.

In our smartphone application, we distinguish between alerts, alarms and collaboration between employees as well as tasks to be performed. Better communication between employees at work provides better utilization of resources and unnecessary extra work in finding colleagues and giving messages.

The employee log on to a mobile device when arriving the shift. Employees are then assigned a role automatically or manually select by themselves. The solution is based on the assumption that employees have a role that has one or more functions in the department and the hospital. Employees will then be given the status of logged in and available. When an employee is logged into the system, the others will see the role, title and availability. In the mobile app, employees can search for colleagues by name, role, title or team. The solution supports the creation of teams so that a group of employees can have their own group chat.

Integrations with other professional systems are an important factor for a comprehensive solution with less work and better security. We expect a single sign-on functionality to be used for authentication.

When staff leave a shift, they log out and the directory is updated to release device for other users. The solution can be configured with a "must be manned" role and prevent logout before replacement is in place or give notice of lack of staffing on role.

The system have built in support for active RTLS (real time location services) and supports use of mobile devices* without the need for additional wireless tags. The system also work with third party RTLS platforms.

When staff enter a predefined area, a series of events can be activated. For example:

- automated room presence, complete with overview of role and staff ID

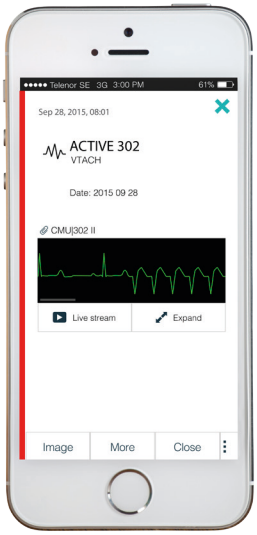
- automatic nurse presence on nurse call systems
- automated alert suppressing of tones for medical alerts received for same location
- automatic access to tasks nearly due for this specific location.

Employee Collaboration

Employees often work in teams with their patients. Therefore, it often makes sense to communicate around the individual patient or team.

With patient-centered communication, staff have a better overview of the communication around the individual patient. Employees can then more easily communicate with more correct resources at the shift.

All information for the application is encrypted. Which patient or team an employee has access to is controlled by the role the employee has at that particular shift. When logging out of the application, all information on the smartphone will become unavailable.



Employee Messages and Notifications

The Ascom Healthcare Platform (AHP) enables fast and secure distribution of information, notifications and alarms. The AHP uses a unique combination of presentation methods to support prioritization of received information by the individual user in the system. These methods is used to support decisions, based on access to information, in the hand of the user.

When notifications are distributed to a mobile user the Ascom UAX app will present the content for the user via meaningful text, color coding, self-explaining icons and accompanied by a tone that indicate the urgency of the notification – even without the need for reading the notification. Parameters for message handling can be set for message types and user groups in configuration.

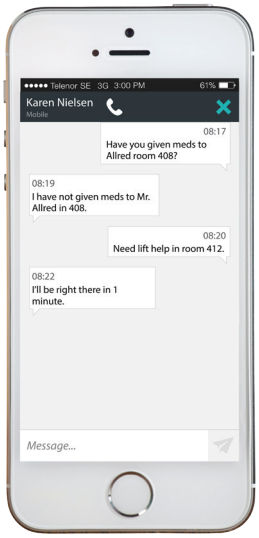
There are three categories of messages the staff can receive: alerts, chat messages and tasks - each of which is handled in its own section of the app.

The alert view contains logic in the individual department of who should have notifications and escalations. Only active alerts are presented to the user. Employees can actively escalate, reject or let the system handle it automatically at redefined response times.

The alerts are presented according to time and criticality. Employees do not have to actively search and find alarms again as they are repeated until cancelled by the system itself, or when alarm state is cancelled at the source of the event.

For example, patient call will be cancelled by room presence or patient monitor alarm disabled by monitor staff. If the system that sends an alarm does not have the opportunity to delete or cancel the alert, a predefined time will then be defined in the integration as long as an alarm is presented. All alerts will be stored in the database for subsequent analysis. It is only information in the application of the individual employee that it is removed.

Chat messages can be one to one between staff, patient centered or team based. All messages are stored in chat history and made available. All messages are stored in the database for analysis. How long the history of the chat should be available is configurable. For example, for each patient, message history will be



available for the duration of the patient's stay in hospital. How long the history is in one by one and in teams in the application can be configured as desired for the individual department and guidelines for the customer.

Tasks can be assigned individually to the individual role or team with a deadline for when the task is to be performed. Employees are notified in the application when a new work assignment arrives or when a task has exceeded the deadline.

Employee Settings

The smartphones application can be customized for users with special needs. For example, those with poor eye sight may have customized settings in the platform. Filtering all alerts to the correct role at the right time with appropriate escalation routines significantly reduces the number of alerts and alarms.

Reviewing which alerts the staff needs and how the department works with the patients is an important element in reducing the number of alerts the individual employees receive.

We find it important that employees have the right use and focus around the main systems against which they are integrated. For example, it is important that staff reset patient alerts in patient rooms.

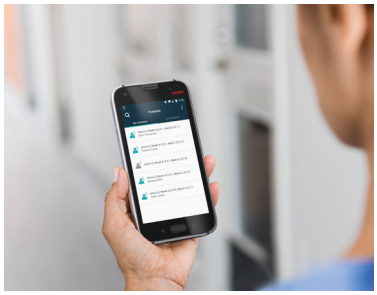
Employee Views

The Ascom Healthcare Platform offers information overviews for both mobile and stationary use. As different information is important for different roles the platform offers different views that can be combined to provide flexibility to health enterprises, clinics, departments or similar.

Ascom's clinical consulting is a natural starting point when planning a new unit, a new hospital or a new technical solution. Hospitals do not need to have an Ascom system/solution to benefit from the clinical consulting service. In fact there is no need to have any system in place, and the service can be used when designing as-yet unbuilt facilities. Or you can opt to use the service to solve specific issues such as alarm fatigue or unsatisfactory alert response times

Care Levels

A **Caring ward**	**Stable with need for sub-advanced medical treatment** ■ Basic nursing ■ Vitals check x 1-4/day	■ No life support by medical device ■ Some use of infusion/volume pumps
B **Emergency Unit, Post-Op Unit, Heart Intensive Unit, Step Down Unit**	**Could be critical condition** ■ Basic to advanced light nursing ■ Some need for continuous monitoring	■ No need for life support by medical devices ■ Use of infusion/volume pumps
C **Intensive Care Unit**	**Critical condition** ■ Advanced nursing ■ Continuous monitoring	■ Need for life support by medical devices ■ Multiple use of infusion/volume pumps
D **OR Theatre**	**Artificial coma under invasive procedure** ■ Advanced nursing ■ Vital checks from every minute to five	■ Full/part life support by medical devices ■ Use of infusion/volume pumps



Mobile Views

On the mobile device the main view is the list of alerts and messages. From here you will always get an overview of the most important things that needs to be handled. Within each alarm or message it is possible to get more information from the source of information. The smartphone app links directly to other apps without manually opening and re-typing information (also applies to third party apps). From the overview, it is possible to add different functions on predefined tabs.

You can add views for tasks, chat and medical device integration.

The flexibility also offers roles focusing on one view, e.g. service tasks, to have relevant information on their main overview.

Stationary Views

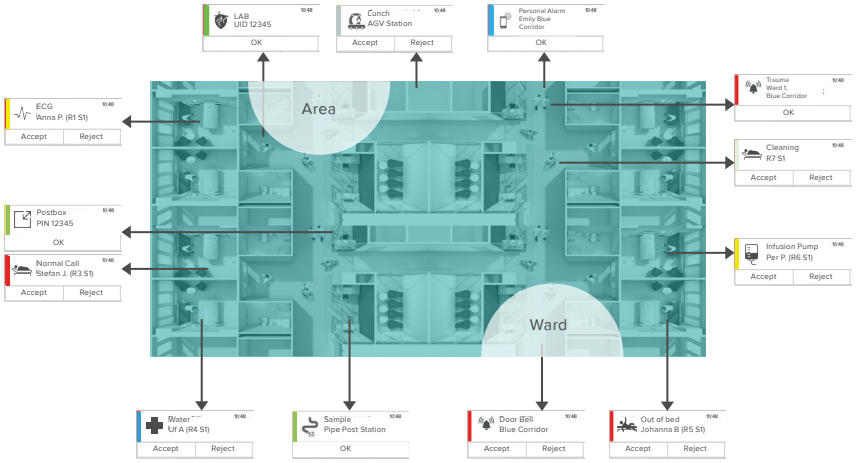
Overviews for workstations or large displays contains information about who is on duty, who is set up with different types of responsibilities, such as coordinating nurses, supervisor for the various medical disciplines, responsible nurses at the various posts. It is also possible to enable administration of assignments.

Additional views could be:

- Medical devices (near-real-time data with vitals and trends)
- Logistic information, transport and service
- Rounds, turning patient
- Critical alerts status
- Building alarms status (fire etc.)
- Personal alarm status (on-site and/or off-site)
- Coordination status

Employee Notifications

The Ascom Healthcare Platform is a scalable and modular platform, which enables fast and secure distribution of information, notifications and alerts around the healthcare environments.



Typical notifications/alerts could be:

- Patient notifications
- Logistic notifications
- Service notifications
- Critical notifications
- Clinical notifications
- Building management notifications

When a new source are integrated to the platform the importance of messages need to be weighed against other messages/alarms. For lower prioritized messages it is also advised to set a limit of the expected message flow, e.g. only one notification per second from the AGV system will be processed.

Patient Notifications

When handling nurse call it is all about taking care of the patients needs in the best possible way while keeping disturbances to a minimum.

When using mobile notification we facilitate a direct communication between the patient and the assigned staff and can enrich the nurse call message with additional information about the patient through integration to EHR (ADT feed). This could be Name, Gender, Location, Precautions and other information, which the staff could benefit from in a nurse call situation.

The Ascom solution have an expandable work surface where you can add up patients and get a fast overview of all the equipment connected to each patient on the unit.

By clicking on the patient you will get trending data and the possibility to open up PACS/RIS, LIMS, and more. It is also possible to get as a mobile application, on mobile devices. This is a solution where you are given the possibilities to register Vital Values data directly into balances scorecards set by the hospital, with direct transfer to EPJ.

If the nurse call system provides two-way speech capabilities, the system will enable the staff to establish a direct voice communication from the mobile device to the patient room or bed in multiple bed rooms. This will identify the patient's immediate needs to support their prioritization decision or to bring supplies to the patient.

With this method, we shorten the communication path between patient and staff.

Logistic Notifications

We can capture any type of event which can be received in a structured format and transform it into a structured task and notification flow. This can be based on notification type and/or location and implemented to support on individual needs.

Task Management

Our platform is flexible and can be adapted to the customer's needs to handle tasks that must be performed. At the same time collecting of data for all the tasks performed leads to a data-driven optimization of staff and tasks at any given time:

This includes task management for:

1. Service organizations, e.g. patient transport, cleaning and logistics.
2. Nursing wards with more patient-related tasks such as dressing, wound care, rounds, etc.

The platform contains all the necessary elements to handle the various tasks that exist in a hospital, including ordering, coordination, prioritization and execution of tasks, as well as follow-up and optimization of the implemented task flows.

Although the platform contains all the necessary elements for ordering, we believe that it is advantageous to consider extending the need for integration to existing clinical systems in order to optimize order flow in connection with, for example, radiology functions and similar needs.

It is possible to create predefined types of tasks that are adapted to the business or department to support. It makes it easier to create new tasks and makes it possible to ensure a uniform execution of the task.

Some examples of tasks that can be created:

- Transport of patient to bed (adult)
- Transport of patient to bed (children)
- Transport of a patient in the presence of a doctor
- Transport of patient in a wheelchair
- Transport of a patient at risk of infection
- Provide unclean bed
- Get clean bed
- Pick up / deliver equipment from / to warehouse
- Pick up special mattresses
- Handle arrived goods / mail
- Handling of food transport
- Collection / delivery of samples

The content and workflow of the task type (rules for how they are created, assigned and performed) are adapted to the organization that will perform the task. This includes rules for automatic assignment, manual assignment and whether it is permissible to override the automatic assignment.

If the organization is a service organization, the types of tasks they own can be configured so that other organizations can order assignments from them. When a task type is made available to others, the task type appears in the list of tasks they can order.

In the configuration interface, the tasks' mutual order and prioritization are defined. This will ensure that patient-related tasks, where personnel have an agreement with the patient at an agreed time, are always given high priority and can be used in connection with examination and surgery. If it is ensured that the patient arrives on time, the risk of delays and canceled examinations and operations is minimized.

Critical Notifications

All types of critical alerts such as trauma, cardiac arrest or sepsis could be handled in the platform. When activated, the emergency alarm is sent out to the various functions of the alarm team with an acknowledgment request. The recipient acknowledges and runs to the location specified in the message. If the recipient does not acknowledge, the alarm will escalate according to predefined list of functions. The process is monitored by an operator who receives procedures during the process if defined.

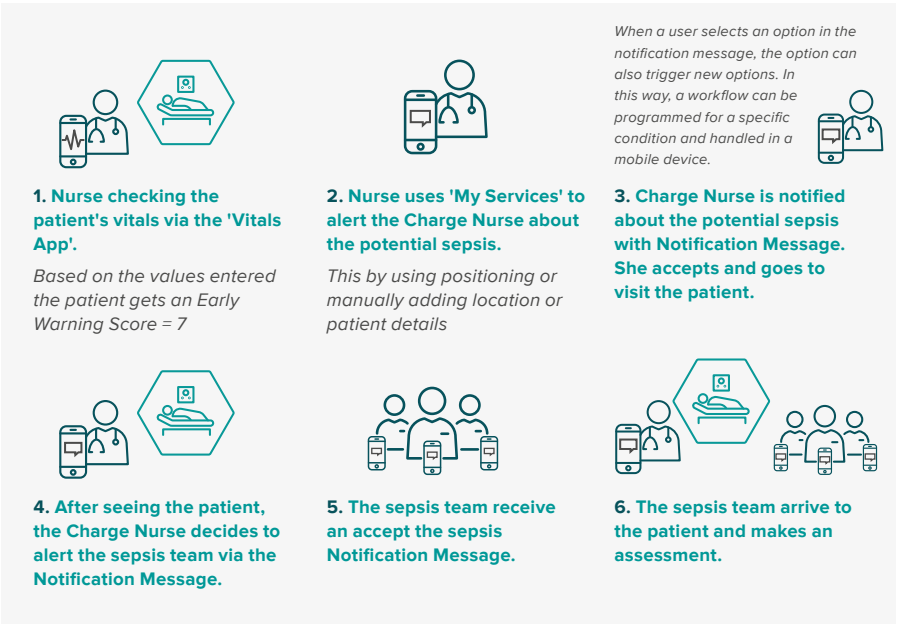
Using a simple and intuitive user interface, the solution supports the operator in the management of critical alerts. The various steps have been predefined in collaboration with the end users, so that the solution uses the most possible automation and default values. This means less stress and increased security in critical situations.

The alarm operator interface gives the operator an overview of all active alarms and their status. When a critical event is triggered, the solution shows instructions that the operator must follow. The instructions are structured and pedagogically arranged with symbols so that it becomes easy for the operator to get an overview and be able to prioritize. During ongoing alarms, the operator also has access to a procedure list in the client where the specific activities of the alarm are presented. These activities are those that the operators must perform because the alarm is active and or before it can be shut down from the client.

For example, in the case of a potential diagnosis of sepsis, the nurse can trigger a “Sepsis notification” from their smartphone. This flow is preconfigured and deployed for a group of users and devices. When activated, the nurse can add information about the patient – for example, the room number, observations, Early Warning Scores and similar – then activate.

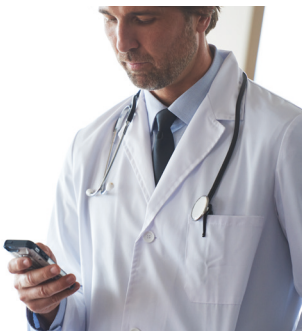
This triggers a notification flow that is sent out to a chain of recipients with request for confirmation. When the recipients accept the notification the information will be updated with different options (for example, trigger blood sample, ask for Sepsis team or notify ICU) based on the workflow for Sepsis.

Sepsis Mobile Workflow



When a user selects an option, the option can also trigger new options. In this way a workflow can be customized for a specific condition and handled in a mobile device.

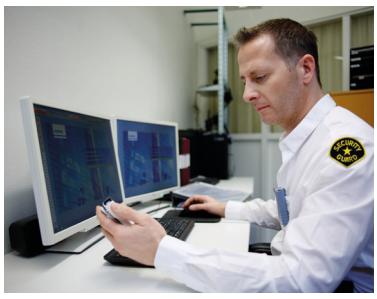
Similar processes for clinical procedures like Infection Hazards, Scoring and Triages can be digitalized with support of a mobile way of working.



Clinical Notifications

The platform can receive/subscribe to ADT feeds from the DIPS EHR system or similar central source of information. As the ADT block can contain valid and useful information that might be used in various situations the information is stored for the specific location. The requested feature to display infection risk is important however more common precautions could be allergies, fall risk, special needs and similar. Those precautions will be added as supplementary information to nurse calls, alerts and notifications as well as displayed on the user's smartphone for easy access. The precaution will enable faster and improved decision making when staff needs to prioritize.

Test results: When the system is notified that a test result is ready, the system will look for the settings made for the organization and send the information to the roles concerned. The roles to be notified is configured in the system on an organization level. Different type of test result can be sent to different roles. In addition, a notification can be displayed on screens.



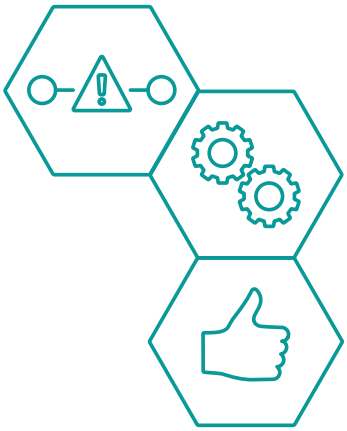
Building Notifications

The solution handles all types of building alarms like fire, fire doors / shell protection, security systems etc. When activated, the emergency alarm is sent out to the various functions of the alarm team with an acknowledgment request. If the recipient does not acknowledge, the alarm will escalate according to predefined list of functions. The process could be monitored by an operator who receives relationship orders during the process if defined.

Using a simple and intuitive user interface, the solution supports the operator in the management of building alarms. The various steps have been predefined in collaboration with the end users, so that the solution uses the most possible automation and default values. This means less stress and increased security in critical situations.

The alarm operator interface gives the operator an overview of all active alarms and their status. When a building alarm is triggered, the solution shows instructions that the operator must follow. The instructions are structured and arranged with symbols so that it becomes easy for the operator to get an overview and be able to prioritize. During ongoing alarms, the operator also has access to a procedure list in the client where the specific activities of the alarm are presented. These activities are those that the operators must perform because the alarm is active and before it can be shut down from the client.

All flows are fully customizable to support different needs in terms of team structure and escalations, message composing, is flow to be monitored by alarm client and similar flexibility.



Interface Monitoring

Depending on the integration method interruption of communication can be detected in different ways. An example is integration with some third party nurse call systems where a heartbeat between the systems is used. If a heartbeat is missed it is possible both for the nurse call system and the messaging system to react. For nurse call systems a common way to get the messages to the recipients when communication fails is to activate legacy devices such as corridor displays.

Another example is medical device integrations where it is possible to listen for loss of data flow from each individual device (e.g. patient monitor, ventilator). If a device stops delivering data it indicates that no alarms can be sent either and the recipients with the corresponding role that to get alarms from that device will get a notification indicating that the device is disconnected.

It might not always be best to send an alert to the recipients, it might instead cause unwanted interruption to their work and alarm fatigue.

Clinical Alarms and Alerts (MDD/MDR compliant)

In critical care, the ever-increasing number of alerts - all possibly very urgent - needs to be managed. The resulting noise can cause patients to suffer from sleep deprivation, which can lead to delirium. At the same time, caregivers can suffer from ‘alarm fatigue’ due to the sheer quantity of alerts, which can lead to compromised event response.

The demand is increasing to distribute alerts to the caregivers in a way that can be trusted. The healthcare industry is working with two new concepts to reduce the noise in hospital environment – Quiet ICU and Silent ICU.

Leveraging the latest interoperability profiles from IHE (Integrating the Healthcare Enterprise), medical device manufacturers and clinical application vendors collaborate to create quieter ICU rooms and better responses to actionable alarms. When a medical device, usually located by the patient bedside, needs the attention of a caregiver, an audio pause is used and the patient room remains silent until a caregiver is able to intervene.

Benefits of 'Quiet ICU' rooms:

- Less noise near the patient
- Tranquility for the patient and the family
- Comfort and healing of the patient
- Improved alert management workflow
- Fatigue reduction for caregiver

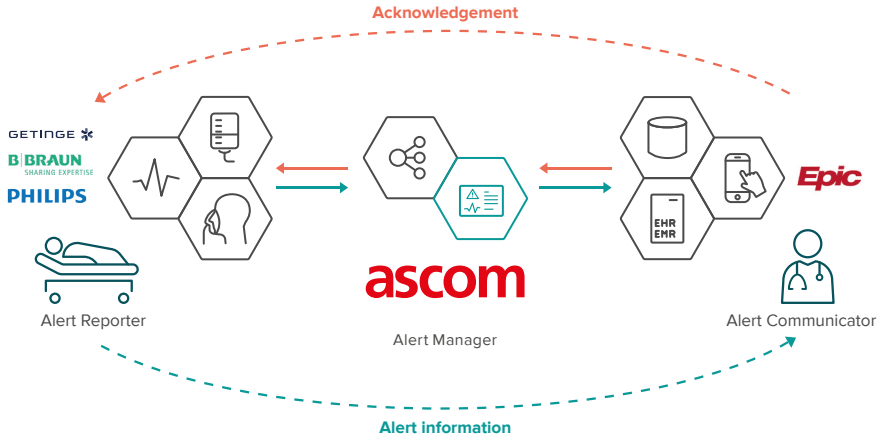


Figure 1 - Example of International showcase for Quiet ICU

The key for a Quiet ICU is an orchestration component called the Alert Manager, which is able to receive notifications, share them with appropriate caregivers, and send confirmation of the caregivers' acceptance back to the source of the alert. This confirmation enables the alert to be paused, reducing noise while the caregiver responds appropriately to the event.

Silent ICU will make the remote alarming system running on the mobile device the primary alarm system. This means that the medical device is silent also when an alarm is initiated, it also means that the door to the patient room might be closed (if all devices in that room are Silent ICU compliant).

The entire chain from medical device to the mobile receiver is monitored and if the chain is broken, including mobile receivers being offline, the medical device will become primary alarm source and staff will be informed that the door to the room need to be open.

The Ascom Healthcare Platform contains software elements for handling clinical alarms in a both secure and efficient way. Alarms can be grouped, filtered, and directed to assigned individuals in the system making sure the real clinical experts handle the alarms.

The Ascom system has an Intended Use statement that declare how the system shall be used. This is a part of the CE mark Class IIb medical device according to MDD 93/42/EEC which is prepared for the transition to the coming European Medical Device Regulation – MDR (due May 2020 but postponed to May 2021).

Ascom has a great number of integrations to medical devices from major vendors available on the market and running on a wide range of sites, mainly in Europe.

Typical device integrations include:

- Patient Monitors
- Infusion Pumps
- Ventilators
- Nutrition Pumps
- CRRT Machine (Dialysis)
- Incubator

Although both Quiet and Silent definitions are referred to as ICU the mechanisms can be used for other High Dependency Units like post-operative, step-down and cardiology units. This is from both an end user perspective as well as solution and regulatory perspective.

Currently the Quiet ICU and Silent ICU profiles from IHE are prototypes and therefore not available for use within healthcare organizations yet. However Ascom has an integration with Hamilton where some of their ventilators are ready for Silent ICU. In this setup Ascom's Digistat Smart Central, which is a PC-application with an overview of all integrated medical devices (alarms and vital data), can act as the primary alarm system, the ventilator can be silent and the door can be closed.

Technical Description

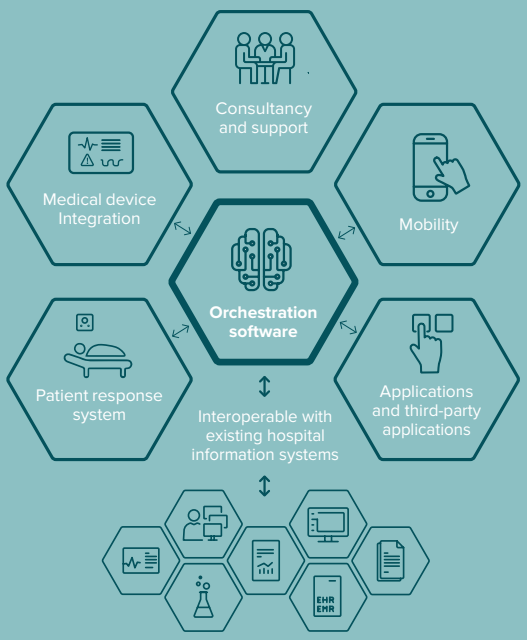
The solution is built upon the Ascom Unite Platform Server which has a micro service architecture on Microsoft Windows. The different services are communicating over a message bus and are using common databases on Microsoft SQL. The platform server is handling message routing to defined destinations on a variety of recipients, including mobile devices. It also provides user interfaces for administration and assignment. There are services for integration to clinical systems and for handling message recipients and redirection of those. Another service is responsible for communication with apps on mobile devices.

The micro service architecture makes it possible to scale up the system as needed. The services can run in multiple instances distributed over several virtual machines utilizing a load balancer to distribute the workload. In combination with a MS SQL Always On cluster the system can deliver a very high availability in such configuration.

The solution also contains traditional Windows Server applications, e.g. MDD Class IIb software for integration to Medical Devices, communicating with the micro services via proprietary Ascom protocols. Also these server applications can be installed with multiple nodes (virtual machines) and utilizing the same high availability database engine.

The integration engines are using a plug-in structure which makes it possible to add new API's and logic for 3rd party systems to interact with, without need for new software releases. Preferably the interfaces are built using standardized protocols for the targeted type of integration, but it is possible to create plug-ins with proprietary protocols and customized logics.

The legacy API's services makes it easy to utilize existing infrastructure such as Ascom DECT phones or pagers as recipients for messages.
The architecture makes it easy to add new services to the existing installation. When new applications and functions are developed they will be installed as new micro services communicating with the existing services and databases. This makes all available information in the system instantly available for the new applications and functions and let them interact with existing workflows.



Project Management and Implementation

Once the decision to purchase the solution has been made and the right partner is found, there is still some way to final operation - where the solution is used in everyday life and works as intended. Many are unfamiliar with how the implementation of their new solution will work for them, how the integrations will work and whether the implementation is reached before the set deadline. Most of the time, many of our customers do not know what resources they need to devote to it.

An implementation process encompasses many different tasks and to ensure implementation before start-up, it is necessary to plan the tasks, uncover their interdependencies and delegate the responsibility for each being performed on time. For this, Ascom always works out with you a project-oriented plan that we control the implementation of. And we dedicate a competent Project Manager who has the overview and management throughout the period until the start of operation.

Ascom uses PRINCE2® trained project managers when we implement our solutions. It is both a well-known and recognized management model for project management and to ensure that we live up to your expectations throughout the implementation process. The PRINCE2® method focuses on the right level of collaboration, flexibility, well-defined roles and responsibilities, product-based planning, and active risk management and change management. It provides the right foundation for a successful implementation process so you can get started with the solution.

Ascom's ISO 9001 and ISO 27001 certifications also have a major impact on the effective implementation. Several years ago, we have worked purposefully with our customer-oriented processes and documentation of these in order to comply with these ISO standards and to create the high quality it takes to be a provider of solutions for care and care of people. You can expect an approach to implementing your solution that promotes a thorough plan, adequate time set aside as well as the inclusion of staff resources competent in implementing your solution.

Finally, we always test the solution before commissioning to ensure adaptation to the framework in which the solution should work. It also means that we improve the terms of a solution that should work from day one without frustrating start-up difficulties.

Ascom Clinical Consulting services

Borrow the experts. Keep the expertise.

Most of us in healthcare know clinical workflows and communication systems can be improved. The challenge lies in determining just where and how to make things better. Which is where Ascom Clinical Consulting can help.

With Ascom Clinical Consulting, a registered nurse and a clinical IT specialist work together with nursing staff to scrutinize facility's workflows. The main goal is to collaborate and analyze communication and coordination practices as well as identify unnecessary and time-consuming workflow bottlenecks.

Clinical consultant will suggest improvements that will meet the needs of staff and patients. Finally, our consultant will help staff implement and optimize solutions, conducting post implementation checks to help ensure maximum clinical, operational and financial value.

A modular process—you choose what's most relevant.

Ascom Clinical Consulting comprises three phases or modules. You can select all three, or start with one and advance at your own pace.

Analyze your situation

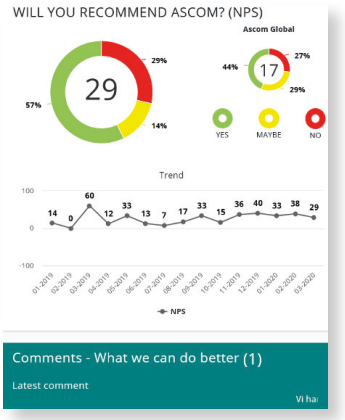
The clinical consultant will shadow different shifts, departments and workflows observing work processes and analyze data flows between individual clinicians, teams, patients, devices and IT systems.

Optimize your workflows

After analyzing the data, the Ascom team propose a solution and present it in clear, accessible language. The solution is aimed at optimizing clinical communications and workflows, and is based on the data collected in the 'analyze' phase

Monitor performance

Once the solution has been implemented, the solution performance will be evaluated and feedback will be collected from the end-users. The follow-up meetings are crucial. They provide data which can be used to further improve the solution



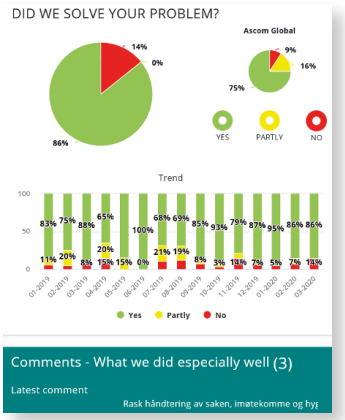


Fig. 1 – Customer Satisfaction Measurements, Ascom Norway 2019-2020

Customer Care and Support

Successful implementation of Health Logistics requires a high user involvement prior, during and after the implementation phase to secure a high user adoption and thus a high return of the investment cost for digitalizing Health Logistics.

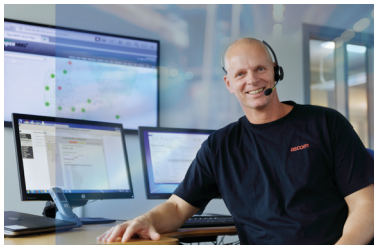
The purpose of the Ascom Customer Care and Support model is to secure a high and continuous User Satisfaction through an efficient Solution Life Cycle Plan. The Plan regulating service levels, software updates/upgrades and incident and complaints. The Customer Care and Support function consists of both a local and global level ensuring that incidents and complaints are escalated to appropriate competencies for fast and efficient resolution.

Ascom Customer Care and Support consists of dedicated +200 staff placed in 13 different regional services desks as well as four global third line service desks placed in Gothenburg (SE), Utrecht (NL), Bradenton (US) and Morrisville (US) for 24/7 availability globally. Ascom works according to ITIL when it comes to Incident and complaints, escalations and roles. We have one global incident process and one global tool-set, and performance is monitored both locally and globally, and it is included in the globally reporting.

Ascom offers a number of Customer Care and Support functions, which are further adjusted to the specific needs from our customers:

User Satisfaction

- **Training** – continues as a demand after go-live for new employees or new functionality either based on agreed class-room training or e-learning based training for different roles. Both training methods document that staff are trained/ certified ensuring compliance with documentation regulations for Hospital quality system and as an MDR requirement when relevant.
- **Monitoring** – as part of the 'Ascom clinical implementation' model it is essential to monitor and follow-up with each department to evaluate and adjust configuration if needed. At the operational management meetings between each hospital and Ascom the frequencies for monitor and follow-up meetings are agreed upon and planned for.
- **Extended 'go-live' support** – option to sort out usability issues from technical issues can be supported by our clinical consultants during post go-live for each department as it in most cases takes some time to get used to new ways of working despite training. You will benefit from the clinical teams professional experience with implementing health logistic systems and ways of handling start-up issues.
- **Customer Satisfaction Measurements** – Ascom currently measures customer satisfaction per incident/ticket solved. This can optionally be extended to specific users groups in agreement with each hospital.



Solution Life Cycle Plan

Solution Life Cycle

- Access to the Ascom Helpdesk and technical support Response times are determined by SLAs.
- Remote support for technical queries (provided customer approval for Ascom to remotely connect to the customer environment). Ascom will provide technical advice regarding the solution including assistance in analyzing errors, and support to system administrators and “Super Users” in connection with the daily use of the solution.
- On-site service includes that a qualified Ascom Support Engineer who will visit a customer's organisation and perform the necessary diagnosis, and restore the system or function.
- Preventive Maintenance includes on-site analysis of the installed system. Ascom will provide a written report to the customer, including recommendations on how to improve system reliability and performance. This service is performed at a predefined frequency during the contract period.
- Remote monitoring enables Ascom to remotely monitor the installed system during the defined support hours. Ascom collects logs and monitors all faults reported from the system. Errors that could affect the functionality are addressed according to the agreed service levels. Ascom contacts the customer before initiating troubleshooting and corrective actions. Noncritical errors are collected and reported to the customer at regular intervals, to be included in a long term maintenance plan. The logs collected by Ascom contains only technical information about the system, no patient data or message contents are sent out from the system.
- Software updates and upgrades (SMA), regular updates and upgrades of Software are available for download.
    - Embedded software will be updated or upgraded if applicable.
    - The customer is entitled to updates and upgrades released for the system during the continuance of the contract.
    - Updates: Ascom offers assistance to the customer in the installation of updates. In the service packages Silver and Gold any work that can be performed remotely
    - Upgrades: Ascom offers assistance to the customer in the installation of upgrades as well as training for the customer’s staff in the use of upgrades made to the system as soon as reasonably practicable after the installation of an upgrade.
    - Third party software (including open source software, e.g. Android software) may be updated to new release levels if required.
    - Pending the complexity of the installed system with integrations etc. the Solution Life Cycle Plan might include specific customer staging systems including test and approval before putting into operations of available updates and upgrades.

Customer Care and Support Processes

Ascom is certified and maintain a number of ISO standards such as 9001, 13485 and 27001. We also comply with MDD (to be replaced by MDR) as well as GDPR. We have regular internal and external audits to ensure compliance and improvements.

As illustrated below the customer incidents and complaints are reported by WEB portal, E-mail and phone and we currently use JIRA Service Desk to register and follow-up on all incidents, complaints or change requests. One tool across Ascom global ensures transparency for both performance reporting to customers and internal reporting.

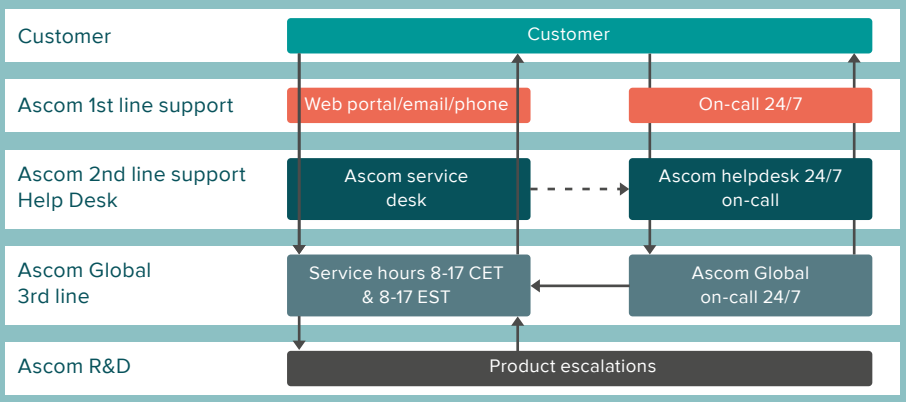


Fig. 2 Customer Care and Support process

In order to maintain and improve performance we have regular operational meetings with key customers for reporting on performance as well as to discuss the planning on releases and new functions.

Figure 3 shows an illustration of a standard performance reporting from our Service Desk on incidents (category/type), resolution times, SLA performance etc.

Fig. 3. Ex. of performance reporting to customers/internally on key customers

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