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THE BUILDING INFRASTRUCTURE AND HOME CARE

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Abstract
Purpose – To discuss the importance of the facilities management in Home Care service. Design /methodology/approach – A case study of a project where new assistive technology was used to improve the security for elderly in Home Care service.

Findings – The infrastructure of a multi-story building is of vital importance for the delivery chain of Home Care. The care provider is depending on the functionality of the communication network in the home to sustain the care during the time of "care absence" from the tenant or the patient.

Research limitations/implications – The study is performed in Sweden on one sample. The sample is from a project performed by a Home Service agency. In the project 142 elderly people living in their own homes were included in a test of a new safety alarm system. Further research must be performed to identify how care and medical treatment could interact with the facilities management in order to provide safe and secure health care in the home.

Practical implications – It is important for the facilities management to be aware of the fact that more and more advanced medical care will be given in peoples own homes. The infrastructure in the building is of vital importance for such activities. The facilities managers should take a more active part in the development of home care.

Value of paper – This is a new area of research. The relation between the facilities management and the care provider in home care is mostly unknown to the professionals within the facilities management but is of high importance.

Keywords Buildings, Infrastructure, Facilities Management, Home Care

INTRODUCTION AND BACKGROUND

Today people are living longer in the industrial world (Gordon, 2000) and most of them want to stay at home as long as possible (Arnaert & Delesie, 2001). "Aging in place" (Cheek *et al.*, 2005, Mihailidis *et al.*, 2004) is for most people a desired way to live as elderly. Only when the need for care is so big that it is impossible to deliver it at home, a move to a nursing home will be necessary. With the help of home care, this desire is possible to support. The home care is different to the care given in a nursing home in one important aspect; the surveillance is not as strong as it is in a nursing home. One way to bridge this gap is to use Telecare (Finkelstein *et al.*, 2004). It means for the caregiver to be virtually in place (Demiris *et al.*, 2003) and to have contact with the resident 24 hours a day. This is both efficient for the caregiver but also a way to give the resident a safe and secure stay in the home (Meystre, 2005). Telecare and Telemedicine is also a way to meet the expected expansion in care demand from a growing population of elderly people in the industrialized world. There are many examples and experiments using Telecare and Telemedicine all over the world today (Black *et al.*, 2001, Bratan *et al.*, 2004, Rosser *et al.*, 2000) but there are also obstacles to be overcome (Olsson *et al.*, 2004). An important effect of this is that it turns the home into a kind of ward at a distance. Care and medical treatment will be delivered in the home of the resident and this will mean new demands on the facilities management. For instance, it is not uncritical to turn off the water or the electricity to perform maintenance in a building where an advanced medical treatment is going on. It is also important for the caregiver to know what the infrastructure of the building can handle and what

kind of protocol it is using. The infrastructure has become an issue for different actors (Kun, 2001). Today the electricity is standardized in a country but the telecommunication is not. But it is on the telecommunication and the data communication the new Telemedicine and Telecare depends. Telemedicine, video and telecommunications can be used to replace long travel and to both give the patient a better life quality and to reduce treatment costs. Telemedicine systems can also be assessed by the intelligent home monitoring devices in Smart Homes. Normally telemedicine systems have a broader and more individualized approach than the Smart Home system has (Demiris *et al.*, 2006).

Care at a distance must rely on an indirect contact between the care provider and the resident during the time when the care staff is not in place or in direct contact with the patient. Care at a distance means that someone else than the caregiver manages the ward bed. In the direct care situation the caregiver controls the whole care process.

At the hospital, the care staff and technology can supervise patients in a critical condition; i.e. patient surveillance with control of saturation, pulse- and heart frequency, non-invasive blood pressure readings and with the alarms and readings continuously monitored by personnel in a intensive care ward. The hospital technology is based on redundancy, careful support and regular control of functionality. The establishment is organised and managed by the caregivers Facilities Management (i), Figure 1, and the caregiver has access to all spaces and handles the whole infrastructure in use. The Facilities Management has medical technicians, technicians and computer experts. When a hospital is planned and built the technology is an important part of the planning process. It means that all Technology (i) in use is adapted to the caregivers infrastructure and all parts of the technology function together.

If an emergency occurs, normally all the care resources are found in-house, i.e. specialist physician, specialist nurses and care personnel. An error in the infrastructure will be discovered and treated quite rapidly. The risk for a patient to be left without supervision for a longer period is minimal.

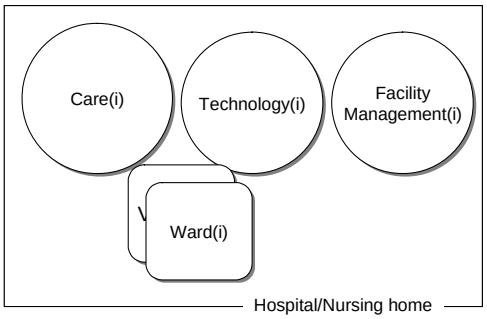

Figure 1 The hospital is a controlled environment

At nursing homes the personnel needed for the care to be handled is in place 24 hours a day 7 days a week. At a nursing home the resident normally does not have the same need for medical treatment as a patient in a hospital. But if an acute situation emerges the organisation must be able to deliver assistance with all possible speed, e.g. if there is a power-cut or shortage of staff.

When care is given at a distance the situation is in many ways different. In this case, the caregiver only has full control over limited time periods and parts of the care process. Care at a distance means that the caregiver only has contact with the resident during short but regularly recurrent occasions in the resident's home. In the meantime, during the care-absence, the contact must be sustained with the help of technology and ways of communication that suit the resident. For those having more advanced medical care given at home, it can include surveillance through different kinds of sensors attached to the body together with analysing technology, which automatically gives an alert when measurings diverge from expected readings. For those with home services the communication might be the safety alarm or an inactivity control connected to the resident's telephone outlet. To handle acute and unscheduled activities during the care-absence, the caregiver must make use of unscheduled care given on short notice, Figure 2.

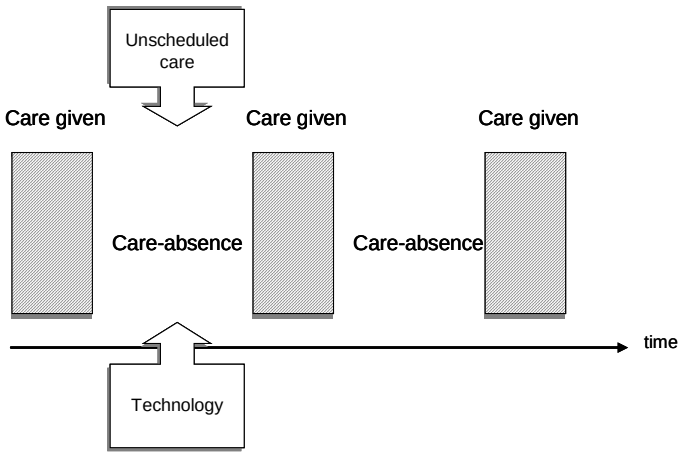

Figure 2 Technology is a prerequisite during the care-absence

To be able to call for unscheduled care during periods of care-absence technology is a prerequisite. Unscheduled care means care given by a mobile team with access to information about a specific resident at any time at all, but normally at night-time or at week-ends and holidays. The team also need to have access to the resident's home without the resident's assistance, and to get in contact with back-up support if necessary.

For the care process to function the caregiver must rely on technology without having control over all components included in the technology.

Figure 3 shows that the care technology, both in the home, Technology (h), and at the caregiver, Technology (c), is connected to the technical system in the building, Technology (f). Examples of Technology (f) are electricity, lockers, and telephone lines and WAN supported by the Facility Management of the estate. Technology (h) in home care is normally a safety alarm managed by the caregiver. Technology (c) is mainly different kind of alarm receivers and communication equipment supported by the caregiving organisation.

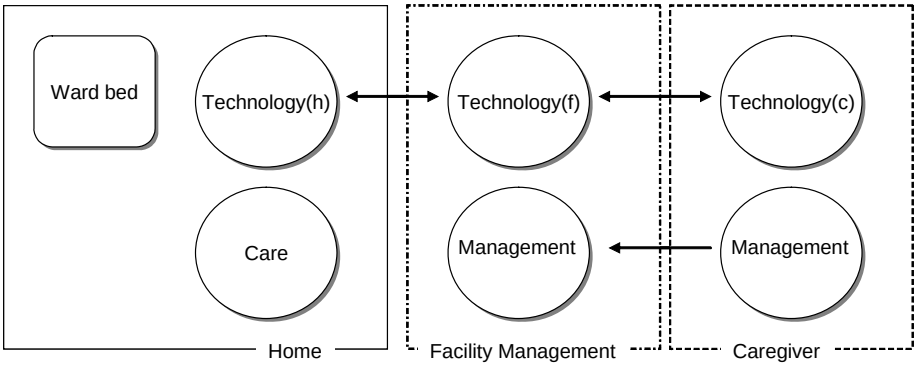

Figure 3 Care at a distance outside the caregivers' space

The consequence of this is that the caregiver is dependent on the facility management since the infrastructure of the estate is a part of the care process. This is something that is indirect and normally not discussed between the caregiver and the facility management.

The thesis here is that this is a hidden but important connection between the caregiver and the facility management. This relation must be explicit and structured to secure the quality of future medical treatment and home care. The demand for cooperation is increasing when the technology part of the care and medical treatment at the home is growing, that is, when Technology (h) becomes a more and more important part of delivered care and when Technology (h) becomes more and more sophisticated. It is therefore necessary to keep Technology (h), Technology (f) and Technology (c) compatible with each other.

This study gives an example of how a caregiver tried to use sophisticated Technology (h) to improve the quality of service given to the residents.

METHODOLOGY

The implementation of a new sophisticated safety alarm system for residents with home care from a care provider was followed. The study is based on action research (O'Brien 1998) together with interviews and correspondence by letter with the management of the care provider and the personnel responsible for the alarms. The alarm reports have been confirmed, as has the supplier's correspondence in each case. The alarm receiver log has been studied at every visit to the site. The result is based on 28 reports regarding difficulties or faulty equipment. The site was visited once a week during the period January to May and again during the period August to October 2004. The author also attended meetings between the supplier and the care provider where the alarm situation was discussed.

The implementation was done by the personnel of the care provider based on instructions from the developer of the alarm system. The safety alarm was installed at 142 residents households during five month in the year 2004. The safety alarm was not only a passive alarm, e.g. an alarm is emitted when the resident pushes a button on a wrist unit, it was an active unit that was able to send an alarm if the resident had fainted or left the apartment. It also kept track of the use of the safety alarm unit. The safety alarm was connected to the resident's normal telephone lines, and it had all the communication features of a standard safety alarm. When an alarm was emitted it was sent to the care provider where the personnel, both on a computer and on a mobile phone, received it. All alarms where logged and the log was saved on the computer.

The test was conducted in a nursing home and in the area where the nursing home was located and where the care provider was responsible for the home care services. To begin with some of the personnel were given special training in the alarm system and in how to install the alarm. They in turn were responsible for the training of the whole staff in how to install the safety alarm in the resident's home. The set up was as follows:

- Residents in the nursing home: 39
- Residents in ordinary apartments in multistore buildings: 121
- Staff during daytime: 15
- Staff during nighttime: 4

All of the residents in this study had a traditional safety alarm to get in contact with the care provider in the time of care-absence. They were all used to the behavior of a safety alarm, the only obvious difference was the wrist unit. They were all informed of the new equipment and of the benefits that the new facilities would bring to them. Especially the automatic alarm if one had fall was much appreciated. The options in the new alarm are illustrated in Table 1.

Table 1 The options in the new alarm system

Alarm type	Manual	Automatic	Call back function
Push button	x		x
Fall detection		x	x
User gone out/come home		x	x
Passive user		x	x
Deterioration alarm		x	x
Alarm on/off wrist		x	x
Door alarm		x	x

All of the 150 residents where using safety alarms and all of them were to be shifted onto new ones.

FINDINGS

The installation started on the 1st of March 2004 and was planned to be finished three weeks later. The trained home care teams would perform all installations. But the installation had to be postponed because of a problem in connecting the alarm to the telephone net. It was just an adapter for the Swedish telephone net that was missing. So the installation actually started in April 2004.

Pretty soon there were complaints about the alarm. It was beeping in the middle of the night and awaking the residents. After a while other complaints about broken telephone conversations were lodged. The alarm could, without a warning, set off in the middle of a call the residents were having. This made the installation process slow down and instead of having all of them up and running by the end of March as was planned, the actual process looked like this:

Table 2 The Installation process

Date	Numbers of installed alarms
04/15/04	14
05/05/04	25
05/10/04	90
06/07/04	110
08/10/04	142

The technical explanation was that the alarm had the highest priority and it could therefore terminate an ongoing call. This functionality was not highlighted in the information from the supplier. Other complaints came from relatives who could not get in contact with their old relatives, which caused anxiety among them.

During the test several reports where made regarding problems that occurred. In Table 3 the reports are sorted according to date of occurrence.

Table 3 Reports of problems during the test project

Date	Report #	Problem type	Issue
29-mar-04	1	A	Installation is complicated
13-apr-04	2	B, C	Users' phones are blocked, call back out of order
15-apr-04	3	A	Installation problems
30-apr-04	4	B, C	Users' phones are blocked, call back out of order
05-maj-04	5	D	High frequent users blocks the system
10-maj-04	6	B, C	Users' phones are blocked, call back out of order
07-jun-04	7	B, C	Users' phones are blocked, indicates traffic problem
08-jun-04	8	E	Users' phone calls are interupted by the alarm
09-jun-04	9	F	Alarms out of order, users want old system back
17-jun-04	10	C	Call back out of order
25-jun-04	11	G	User fell but no alarm was sent
27-jun-04	12	E	Users' phone calls are interupted by the alarm
30-jun-04	13	H	Alarms are sent without reason
09-jul-04	14	I	Modems in system out of order
16-jul-04	15	F	Alarms out of order, users want old system back
26-jul-04	16	F	Users alarm out of order
27-jul-04	17	J	User complains about sky high telephone bill
29-jul-04	18	F	The night team removed a faulty alarm
03-aug-04	19	G	User fell but no alarm was sent
06-aug-04	20	H	Alarms are sent without reason
07-aug-04	21	J	User complains about sky high telephone bill
12-aug-04	22	K	Manual alarms are not sent.
13-aug-04	23	J	User complains about sky high telephone bill
16-aug-04	24	K	Manual alarms are not sent.
30-aug-04	25	A	Problems in users alarm installation
03-sep-04	26	A	Staff complains about long installation time/alarm
13-sep-04	27	L	System blocked by queing alarm calls
17-sep-04	28	H	Alarms are sent without reason
05-okt-04	29	B, C	Users' phones are blocked, call back out of order
25-okt-04	30	M	Extreme amount of alarms during the week-end
27-okt-04	31	F	Users alarm out of order

The most frequent problems reported were “Call back out of order (C)” followed by “Users telephone blocked (B)” and “Alarm out of order (F)”. They are all three problems that put the whole safety alarm system into an unsecure state. Another related problem is that people loose confidence in a new technical system quite fast if the system is troublesome. This is what happened during the project.

The evaluation of the problem showed that the powerful alarm system was able to send so much information about the resident’s activity and behavior, that the telephone lines often were occupied. Earlier, the resident was emitting the alarm but now the alarm itself decided when to send an alarm. A close check of the structure of the alarm system also revealed that there was no internal strategy that gave different classification to different kind of alarm types. There was not even a simple split between information and alarm. Since the alarm was set to collect all possible kinds of information from the user, there was also an overflow of information sent from the user to the care provider. This meant that the lines where busy at the care provider, when all the information was sent from the users. When this happened, the alarm was first trying to call again for five times. When this didn’t succeed, the alarm tried to notify the resident about the failure and started to beep. The alarms were acting according to the suppliers specifications, but the specifications did not match the communication system in the residents’ homes. Several of the residents were in contact with their telephone company to report the malfunction of the telephone system. But the telephone company could quite easily see that the problem was residing inside the alarm in the user’s home.

When the test was terminated, all the users got back their traditional safety alarm.

CONCLUSION

The conclusion was that even if it would have been interesting to have all kind of information about the resident to improve the surveillance in the time of care-absence, the infrastructure in the building was not able to handle all of that information. Nor was the infrastructure at the care provider enough for such huge amount of information through the telephone lines. The care provider wanted to improve the quality of service in the residents' home, and had chosen a safety alarm, which could deliver a lot more than a traditional alarm can do. The concept of the care-absence is a reality to the care provider, but how to replace this absence with virtual presence, was not appropriately analyzed. The solution they did choose was in fact transferred from an institutional alarm system. But in the home the telephone lines have not enough capacity to transfer huge amounts of data without interfering with normal calls. The Technology (h) was not compatible with the Technology (f) and therefore lowered the quality of service from the care provider. The safety alarm was hooked up to the telephone network, but if the alarm system instead would have been connected to a new IP-telephone system, problems with the alarm could have been an issue also for the facilities management.

This study shows in a simple way how important it is to analyze the whole chain of delivery before any new technology is implemented. And the facilities management rules over one most important part of this chain. Today the infrastructure of the new houses in Sweden is equipped with digital signal system instead of the old analog telephone lines. This will affect the equipment used by the care providers to maintain a lifeline support for the residents. The new infrastructure in the buildings requires a new safety alarm system, which can send alarms either on digital lines or by GSM. Whatever transmission system the care sector uses for its system, there will always be a shift in the infrastructure to newer and more efficient systems. Thus there is a constant need for cooperation between the care providers and the facilities management. One issue worth thinking of is whether the facilities management should take an active part in the coming development of home care. The demand for Internet in the home and the digital telephone together with digital television transmission calls for new infrastructure in the apartment. The operators deliver one cable to the new houses today in Sweden and inside this one all three communication forms is packed, so called "triple play". To this, individual energy control in the apartment can be added. So there is already a powerful force pushing the facilities management towards more data and telecom equipment. The triple play cables have to be split into outlets in the apartment and this is done with electronic equipment, which most likely will be placed inside the apartment. All this new equipment will change the facilities management and it will call for a discussion of responsibility. If Telecare and Telemedicine is to function in this environment the risks and the responsibilities must be clear. Otherwise this will be an obstacle for the development of Telemedicine and Telecare.

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