An Unparalleled Triumph

The introduction of and international discussion on Coronary Care Units (1960-1975)
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Literature
Foreword. History of coronary care

In the 60s of the previous century specialized units were introduced for patients with suspected acute coronary disease, where acute heart infarction could be diagnosed and monitored. These special care units were called the coronary care units (CCU).

Since the major threat for patients suffering from acute myocardial ischemia in those years was development of ventricular fibrillation, the external defibrillator was developed by Bernard Lown in Boston. He had proven that these devices were extremely effective in resuscitation of patients suffering from ventricular fibrillation due to acute myocardial infarction. Coronary care units were developed and instituted in most major hospitals in the Western world.

In the 70s and 80s new techniques were developed to diagnose left ventricular failure after myocardial infarction using the Swan-Ganz catheter and subsequently two-dimensional echocardiography. In those patients developing left ventricular failure diagnosis could be made early and even be prevented, since hemodynamic measurement could anticipate the development of overt left ventricular failure. By the end of the 80s reperfusion therapy for acute myocardial infarction has changed the clinical sequelae of myocardial infarction significantly. First intracoronary later intravenous fibrinolytic therapy proved to save the life of each tenth patient admitted for acute myocardial infarction. By the end of the previous century fibrinolysis has been replaced by
primary percutaneous coronary intervention which further improved the prognosis of patients admitted with acute myocardial infarction.

Therefore, the coronary care units switched from an observational unit to an active treatment facility. Thus, nowadays CCUs are the centre of each cardiology department.

Since the intensive care units have been developed in the 70s of the previous century, artificial ventilation became widespread over most hospitals. Because artificial ventilation needs usually invasive monitoring, more and more acute cardiac patients went into units which were a combined intensive care and coronary care unit. The major threat for coronary care units is the unification with intensive care units which are managed by intensivists rather than cardiologists. Therefore, the training programs for cardiologists have now a separate program for cardiologist who will be involved in intensive care units.

Finally, the coronary care unit will only survive with dedicated cardiologists with a strong relationship with the catheterisation laboratory for the invasive treatment of the acute myocardial ischemia. And respiratory failure can now be managed in many cardiac cases with the so-called BIPAP equipment which can prevent patients to go for invasive respiratory support in the ICU.

It is of great importance that the intriguing history on how and why new medical techniques such as the CCU are introduced and imple-
mented, is researched. Medical historian Leo van Bergen has done so in this fascinating work on the first fifteen years of the coronary care unit.

Freek W.A. Verheugt
Amsterdam, May 2011
Introduction

About a decade ago the department of Medical Humanities (Meta-medica) of the VU medical centre was invited by the Ministry of Health to set up a historical inquiry into the rise of the units of intensive heart control in the Netherlands. Soon it turned out that this question could not be answered without looking at the swift and general rise of the Coronary Care Units (CCU) (as they were usually called in the Anglo-Saxon world) in countries like the United States, Great-Britain, Canada and Australia, and at the international discussion on sense and nonsense of these units. It was an introduction so swift and general that in their history of the CCU, when stating that ‘the second half of the 20th century may well be considered the era of “coronary care” in Europe and North America’, K.K. Khush, E. Rapaport and D. Waters emphasized the importance of the CCU, agreeing with E. Braunwald who had called CCU ‘the single most important advance in the treatment of AMI’ (acute myocardial infarction). In the following I hope to give an impression of this international discussion on the CCU in the years 1960-1975, followed by a short summary of how the introduction in the Netherlands developed. I will try to throw light on the arguments given in favour of and against introduction, an introduction that was as good as completed by the time medical technology criticism – amongst others focusing exactly on CCU – came to the fore. By that time CCU – looking

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for a justification of its existence – had already changed direction and goal several times. I hope to show that the frequent shifts in the use of CCU resulted from a continuous struggle between expectations and impediments in clinical practice. The medical scientific arguments given in favour of CCU – often presented as the most important if not only factor when explaining the rise of CCU - proved to be less sound than presented. The portrayed future of a healthy heart was built on quick sand, and the very rapid introduction of the CCU in several countries - such as the Netherlands - only partly resulted from medical argumentation.

Although introduction was a fait accompli, CCU-discussion itself did not stop until the end of the seventies for around 1975 it had received a new impulse with the technique-criticism of men like Ivan Illich. At the same time as the welfare-state reached its peak, protest against authority – political as well as medical – reached its peak as well. Healthcare only created a relationship of dependency, and moreover the medical world was inhabited by people not only – or not even mainly – watching over the health of their patients but also – or even prominently – over their own position of power and the healthy state of their wallet. On top of that it was a health care system creating all kinds of iatrogenic effects. For this reason, Illich protested against the march of technological medicine at a time when not only the trust in technology in general was in decline, for instance due the Vietnam War and the report of the Club of Rome, but trust in the medical world as well, for instance

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as a consequence of the thalidomide disaster. Furthermore, the results of the heart transplants, so greatly admired at the end of the sixties and the beginning of the seventies, were not as favourable as first expected, to say the least.

Nevertheless, technology was seen as the outstanding difference between modern and old, in the eyes of some, obsolete medicine. This raises questions, formulated for instance by G. Wackers in his Constructivist Medicine:

However, it is also technology that is held responsible for the disruption of traditional value systems, for objectionable moral and social consequences.¹

CCUs can be seen as an item exemplifying the one-glorification-, as well as the other-disruption. It was greeted extensively as warrior against death from heart disease of cardiac arrhythmia, but also as one of the reasons death itself faded. Because of the invention and practice of artificial respiration in the fifties intensive care units were set up, later on followed by more specialized units such as the CCU. This not only resulted in longer life, but also raised the question where life ended and death began. When exactly does a human being die? Or better: when exactly was decided that a human being had died? Is it allowed for a patient to die? The word ‘death’ became diffused and terms like ‘brain dead’ replaced it, itself again subdivided into different cate-

¹ G.L. Wackers, Constructivist Medicine, Maastricht 1994, 12
gories.\textsuperscript{1} Because of this, modern technology not only brought therapeutic progress, but changed the complete medical profession, as for instance the children surgeon Jan Molenaar stated.

When at the beginning of the sixties reanimation and long term artificial respiration became possible and challenged death to the utmost, the audience began to wonder. Not about the skills, but about the discretionary powers of doctors, at the boundaries of life and death. The time of the paternalistic, authoritarian, Hippocratic way of healing that had existed for centuries, had definitely ceased to exist.\textsuperscript{2}

In an article in the \textit{British Medical Journal}, July 2001, ‘Taking acute stroke care seriously’, the authors argue that even when evidence is absent, I quote, ‘we should manage acute stroke as a medical emergency’. They wonder if specialized acute stroke care should undergo the same discussion as was held on CCU and myocardial infarction thirty years ago. For CCUs ‘were introduced without an evidence base, but, importantly, they did allow trials to be mounted and successful treatments found such as thrombolysis.’\textsuperscript{1} Without raising questions on the actual subject of the article, I do want to question this reference to the discussion on how profitable or good-for-nothing CCU was. Firstly: internationally it

\begin{footnotes}
\item[1] O.c., 282-283
\end{footnotes}
was a marginal discussion, although it waged most fiercely in Great-Britain. Almost all internal and cardiological specialists accepted the life-saving importance of CCUs without any further ado. The CCU made earlier diagnosis and thus earlier treatment possible, and so it just had to have a substantial influence on the mortality caused by heart or coronary disease. Hence every discussion was pointless and a waste of time. Evidence based trials in fact were unethical.

Moreover, introduction of the CCU was accompanied by all sorts of so-called proven reduction figures. Several cardiologists of name stated that after introduction of the CCU in their hospitals, mortality declined sometimes with 40 percent, and, although without any reference, the president of the American College of Cardiology made known that in the US 100,000 lives a year could be saved by massive introduction.

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fact a situation was created that, as we shall see, made one of the few sceptics of all the cardiac-gadgets - as he called them - remark that a cardiologist criticizing CCUs would be as suicidal as an American senator criticizing God, country and motherhood.¹

Furthermore one could suspect from the remark of the authors in the BMJ that the introduction of the CCU had been laborious. Nothing could be less true. In spite of the discussion they pointed at, in spite of some fairly early critical remarks on the introduction, certainly when it would be a quick and massive introduction, there are not many and perhaps even no examples of medical technology accepted and introduced that fast. It indeed was a victory march unequalled, an unparalleled triumph.² In fact we will see that, in spite of what the authors of the 2001 BMJ-article claimed, the discussion on the introduction and practice of CCU proved quite the opposite of introducing new medical equipment no matter what. It rather proved that discussion on introduction of new medical device should be held over and over again as long as sound proof for its effectiveness is absent.


Before telling this story of the international rise of and discussion on CCU, I want to thank all those contributing to it. First of all Eddy Houwaart for the trust he had in me. Also a word of gratitude to Murk Dijkstra, for taking over some of the most laborious work and to Sirkka Blanken-Russo for time and again locating all the different kinds of books, reports and articles concerning the subject I wanted to look into. Also of course the Ministry of Health for making this inquiry financially possible. A very special word of gratitude goes to Herman Simissen for brushing up the English. For their cheerful presence I thank Marleen and Charlotte. It not seldom spared me a heart attack. Slight disadvantage of course is, that for this reason this inquiry is not based upon participating observation.

Leo van Bergen
1 The first Coronary Care Units

The customary conception of CCU-development

'The concept of intensive coronary care was born of despair not ingenuity.' With these words Lawrence E. Meltzer and J. Roderick Kitchell, two pioneers in the field of coronary care, open their story on the development and status of coronary care in the voluminous *Textbook of Coronary Care* (1972), edited by the above-mentioned Meltzer and the Amsterdam cardiologist, A.J. Dunning. Therefore, it is somewhat surprising that in the story itself it nevertheless is not despair about high mortality on heart and coronary disease - in the sixties responsible for about half of total death - that springs from the pages. On the contrary: as in most stories concerning the rise of CCU, all attention is aimed at the genius of a couple of doctors, who in the decades before the opening of the first CCUs made some inventions or brought existing knowledge to a higher level. They saw five phases in CCU-development (to which R.M. Norris ten years later would add a sixth one): resuscitation, vigorous management of arrhythmias, investigation and treatment of pump failure and prevention of sudden death (and limitation of infarct size).

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1 O.c., 3
Did Meltzer and Kitchell assume that their audience was familiar with the despair, even in such a young, post-war phenomenon? Was it seen as a fact not worth further elaboration? Be this as it may, in any case it was despair resulting out of the growth of the number of heart- and coronary diseases for which at first no cure was found. And so, in the forties and fifties, much energy was given to attempts to contain the disease and to lower its prevalence, or at least prevent it from rising further.

Prevention was the magic word, and led to grand scale investigations such as in the American cities of Framingham and Tecumseh. Since those days language has been enriched with terms like ‘epidemiology of heart disease’ or ‘risk factors’, but also ‘the coronary care unit’ (or intensive heart monitoring unit), which after a while developed into the most important attempt to give curation back its place in the fight against heart- and coronary disease. Also terms like primary and secondary prevention came to the fore,¹ which, as we shall see, was not devoid of any importance. The word ‘prevention’ was used and defined in different, sometimes almost contrary ways, because of the positive effect just using the word could and would have.

Anyhow, Meltzer en Kitchell’s story discusses inventions that show that medical innovation - and innovation in general - is a matter of little steps taken by different people, until at last one makes the final step

¹ G. van Herpen, ‘Huisarts, ECG, computer en wazige verzamelingen’, in: A.A.H. Meurs, Huisarts en Cardiologie, z. 1979, 4-5, 4
crossing the line, until at last one puts in the last piece of the puzzle.¹ More specifically, it were inventions without which CCU, at least according to Meltzer and Kitchell and with them numerous other cardiologists or internists, could never have been taken into use. It had, however, become clear that, in spite of all the knowledge built up and all the inventions made, again according to the writers, coronary arteriosclerosis could not be prevented and that the continuously rising number of deaths as a result of acute myocardial infarction, the heart attack, could not be stopped by ordinary means. For instance in 1960 around thirty to forty percent of all patients admitted into hospital because of a heart infarct, died. The huge death toll, combined with the fact that by far most of them died shortly after having the attack, would become one of the major reasons for giving special attention to the patient in the first days after suffering attack.² Meltzer en Kitchell commented: ‘It was only then that a new approach to this overwhelming problem was conceived: an attempt to salvage lives of the patients who died suddenly of rhythm disturbances of the heart.’³


³ Meltzer, Kitchell, ‘The development’, 3
Resuscitation and acute heart death

As Joel Karliner confirmed in his 1981 ‘History of the Coronary Care Unit and its Contribution to Mortality Reduction’, the story that followed the opening of Meltzer and Kitchell was a story many cardiologists told in a short version again and again before they did,¹ and would be repeated after them many times more.² As if to underline his own thesis even the story Karliner himself told was heavily indebted to Meltzer and Kitchell. According to them, contrary to the complicated history of birth of most medical innovations, the story of the CCU was simple and rectilinear. It resulted from gathering two separate lines of inquiry, respectively one into heart resuscitation and one into the causes of death as a result of acute myocardial infarct. On the one hand CCU was one of those things exemplifying the trend towards larger organizations and increasing specialization,³ and on the other hand no


³ Thomas Killipp III, John T. Kimball, ‘A survey of the Coronary Care Unit: Concept and Results’, Charles K. Friedberg (ed.), in: Acute Myocardial Infarc-
more than the next logical step - ‘a natural outgrowth’ as John T. Kimball and Thomas Killipp III, two other CCU-pioneers, called it - in a line set in by D.R. Hooker, W.B. Kouwenhoven and A.R. Langworthy in 1933 with an article in the American Journal of Physiology: ‘Effects of alternating electrical currents on the heart’.

On the basis of animal experiments Hooker, Kouwenhoven and Langworthy developed a method of heart reanimation in which hand massage of the naked heart was followed by open chest electrical defibrillation. Unfortunately the method stayed unsuccessful for many years, but increasingly the reasons for failure were discovered. First of all it became clear that blood circulation had to remain in tact up until the moment defibrillation could start. Moreover it became clear that the period in which resuscitation had to be applied lasted no more than just a few minutes. Applied just a bit later, death was unavoidable.

Although all this was known at the end of the thirties, it lasted up until 1947 before the Hooker-method was applied successfully. It was the American surgeon Claude Beck, famous for his always and everywhere - and so we cannot stay behind - quoted phrase on: ‘hearts too good to die’, who immediately after a chest operation reopened the wound of a 14-year old boy because he developed ventricular fibrillation. Beck massaged the heart and applied electrical defibrillation using two electrodes. The boy survived. Although this incident also made clear that circumstances had to be very beneficial to reach a happy end-

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1 Killipp, Kimball, ‘A Survey’, 282
ing, many hospitals thereupon began to equip their operation wards with defibrillators and began to train their surgeons in resuscitation techniques.¹

Nine years later it was again Beck who succeeded in applying that same technique successfully on a man with acute myocardial infarction, in other words: on someone getting an attack outside the operation ward. In 1956 a 65-year old colleague of Beck suffered a heart attack while making his round. Almost immediately ventricular fibrillation emerged. He was taken to the surgical ward and treated immediately. Beck wrote: ‘This one experience indicates that resuscitation from a fatal heart attack is not impossible and might be applied to those who die in the hospital and perhaps to those who die outside the hospital.’² This conclusion was shared by L.B. Reagan, who had encountered a similar incident around the same time. He too concluded that a myocardial infarct no longer equalled a one way ticket to heaven. But again it was evident that circumstances had to be very favourable. Therefore it is not surprising that there was hardly any influence of these incidents on the daily practice of treating myocardial infarction. As Meltzer and Kitchell put it:

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The necessity of having to surgically expose the heart to perform massage and defibrillation posed serious problems for both the physician and the patient. The formidableness of the procedure tended to dissuade all but the surgically-trained physician from even attempting this lifesaving measure to say nothing of the consequences of opening the chest cavity of a patient already at the door of death from myocardial infarction. In addition, very fortuitous circumstances had to prevail for resuscitation even to be attempted. Specifically, a physician had to be in attendance when the catastrophe occurred (practically with a scalpel in his hand) and then a defibrillator had to be brought to the bedside (or, more likely, the patient brought to a stationary defibrillator) all within a precious few minutes after the onset of ventricular fibrillation. It is hardly surprising therefore that open chest resuscitation never assumed a major role in preventing death from acute myocardial infarction.¹

However, at the same time for one of the four above mentioned difficulties, the necessity to open the chest and expose the heart to make defibrillation, an alternative was suggested. In the magazine *Circulation* Paul Zoll and his associates published an article on administering electric shock in order to stop ventricular fibrillation without having to open the chest. Two years before Zoll already published about ways to

¹ Meltzer, Kitchell, ‘The development’, 4
stimulate the heart with electric current, especially when, not so much fibrillation, but cardiac arrest was the cause of the problems that had to be combated. Through this way of fighting fibrillation and asystolias from outside the body, the number of possibilities of resuscitation were enlarged, and Zoll saw marvellous prospects for still further enlarging this number emerging at the horizon. For instance, as Meltzer and Kitchell said, continuous cardiac monitoring could ‘be accomplished (referring specifically to operating rooms) so that the onset and mechanism of cardiac arrest could be identified instantly’.  

But without in any way wanting to trifle the importance of Zoll’s techniques, they offered no solution whatsoever for the second major problem, to keep circulation going until the moment outside defibrillation could start. Here too success depended on the immediate vicinity of the right equipment. It is clear that this could only be the case in a very small amount of incidents. And so in the vast majority of cases direct heart massage stayed necessary until the moment patient and equipment were brought together. Not for nothing in 1969 John Shillingford and Bernard Lown - the man who in the sixties would rise to be perhaps the most fierce defender of the CCU-concept - would say that in fact the unit was no more than the translation of accidental pres-

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1 O.c., 5; Karliner, History of the Coronary Care Unit, 84; Khush et al., The history of the CCU’, 1042
ence of the necessary tools at the place of calamity into deliberate and continuous monitoring.¹

A year before, the same Lown already had shown another jigsaw-piece by looking at the role of technology itself. The CCU was not just a matter of a medical answer to a medical question. One should never forget that, no matter how much one wants to solve a problem with technological means, one simply will have to be able to produce the necessary machinery. However, here this was the case. ‘At this very time electronic techniques of monitoring heart rhythm reached a high state of perfection.’ Therefore, in his eyes CCU combined new medical expertise with technological progress taking place more or less accidentally at the right time, that is, the same time.²

Four years after the innovations of Beck and Zoll, the solution to the problem of blood circulation was found. In cooperation with the above-mentioned J.R. Jude and G.G. Knickerbocker, in 1960 Kouwenhoven, Johns Hopkins Hospital in Baltimore, published an article in the Journal of the American Medical Association entitled ‘Closed-chest cardiac massage’. In it, he came up with a method for massaging the heart without opening the chest, in general combined with mouth-to-mouth-respiration. It led Hughes W. Day to installing a so called ‘mobile crash cart’ in his two hundred bed sized private Bethany Hospital, Kansas City, Missouri. A bit disrespectful one could describe it as a first aid kit

² Lown, ‘Intensive Heart Care’, 21
on wheels, although equipped with defibrillator and external pacemaker. Furthermore, he developed a resuscitation program in which an especially trained team immediately went into action as soon as a patient suffered from cardiac arrest.¹

The expectations were high, but the results flatly speaking abominable. In more than 96 percent of the cases, the efforts were in vain, a number not differing from the national average. It clearly showed the inefficiency of the resuscitation method. At a re-evaluation three months later this situation still had not changed for the better. Probably after a visit to the laboratory of Zoll with its monitors, pacemakers and defibrillators,¹ Day thought that this had to be a consequence of the fact that the patients were not continuously monitored. The time wasted because of this just had to be the reason behind the fatal outcome in a vast majority of the cases. For this reason, the machine should not be brought to the patient, but the patient should be brought to the machine. Moreover, so he himself stated ten years later, it had become clear to him that the nurses were not in possession of enough theoretical knowledge to fulfil their task successfully. Hence erecting an especially trained nursing team was of the utmost importance.

According to other sources, however, it was Meltzer and Kitchell who were the first to emphasize the importance of especially trained nurses, precisely because, it is true, Day observed a lot, but hardly ed-

ited his many data, whereas Meltzer and Kitchell tried to draw some conclusions out of the enormous amount of figures they collected. Be this as it may, Days conclusion was that patients should be under constant surveillance in a surrounding completely fitted for recognizing, treating and if necessary reanimating a patient any time. Machine and patient should in fact become one. By the way, this idea does not seem to be as original as has been said many times, for instance in sentences like the ‘the insight of Hughes Day and others’. For instance in 1970 J.O. Leibowitz wrote that Day probably borrowed his insight from special units after open heart surgery, of which the first ones were erected in Minnesota in 1958.

An interesting marginal note to this straightforward story leading directly to the intensive coronary units, came from cardiologist F.W.A. Verheugt in his inaugural speech in 1989 for the Free University of Amsterdam. Not as flashy as the technological developments, but maybe of more importance were the developments in pharmacology, especially the development of drugs combating the coagulation of blood. Or at least: they could have been. For instance in Germany in the fifties a drug was made out of streptococci bacteria. It had an enzyme capable

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1 A. de Neeling, Afscheidscollege, 18 december 1985 (onpubl. man.), 7
3 Grace, Keyloun, Coronary Care Unit, 18
of dissolving coagulations. It was Sol Sherry from Philadelphia who first gave this drug, streptokinasis, to patients suffering from a heart infarct, hoping it would dissolve the coagulation in the coronary artery causing complaints. In 1959 he published his findings in the *Annals of Internal Medicine*. Sadly enough Sherry was not able to find the exact amount of the drug nor the time treatment should take. It soon became clear that treatment with streptokinasis led to severe by effects, such as internal bleeding, whereupon it was considered life threatening.\(^2\) As a result, when soon after heart- and coronary disease was acknowledged as the biggest enemy of humanity, not the treatment of coagulation but of rhythm disturbance was considered to be of main importance. Attention was replaced from the coronary artery to the heart itself, although the room of treatment was baptized *coronary* care unit. Not for nothing Verheugt thought the Dutch name ‘hartbewakingseenheid’ (heart monitoring unit) more in place. Thereupon also the invention of new drugs, such as lidocaine, was focused at the heart itself. This however means that consequences were fought, and the cause was left unharmed. ‘Sadly enough coagulation treatment with streptokinasis was completely forgotten.’\(^3\) The point Verheugt tried to make is clear. A linear history only seems to be linear in hindsight. If the experiments with

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2 F.W.A. Verheugt, *Coronary Care: van bewakingsbedrijf naar schoonmaakbedrijf*, inaugural lecture VU-Amsterdam, 13 oktober 1989, 5-6
3 O.c., 6; So it was not Day who first came up with this name as Julian - and referring to Julian, Khush et al. - says in his ‘History of the CCU’. Julian, ‘History of the CCU’, 498; Khush et al., ‘The history of the CCU’, 1042
streptokinase had not been stopped after the first disappointing results, the future of the struggle against heart- and coronary disease would very likely have been different, but also that future would afterwards have been pictured as logical and linear.

**The CCU of Hughes W. Day**

Because of lack of government support, in 1960 Day and his companions started negotiations with a private foundation, the John A. Hartford, in order to develop an eleven bed sized CCU. The Hartford Care Unit existed of a seven bed hall for medical and surgical patients and four separate beds for patients with acute myocardial infarction. It is not surprising that myocardial infarction had Day’s main attention. As said around 1960 heart- and coronary diseases were responsible for about half of the death rate, and of that half again half was caused by ischemic heart diseases. Of them myocardial infarction is the most important one.¹ According to Verheugt, for a cardiologist ischemic heart disease in general and myocardial infarction in particular is what a ruptured wrapper and ‘a meniscus’ are to an orthopaedic surgeon: his main source of income.²

In may 1962 Day could open his unit. He could indeed not have done so without the support of the Hartford Foundation, because the ‘intensive coronary care area’ turned out to be an expensive kind of care. Day was in a rush to comment that in the future this certainly

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¹ Hart en vaatziekten. Een statistische verkenning, CBS/NHS 1972, 12, 16
² Verheugt, ‘Coronary Care’, 3
would no longer be the case, without, however, explaining why. Thus there is reason to doubt this judgment, a doubt strengthened by the fact that already two years later a new grant from the foundation was necessary for buying an apparatus making it possible to study electro cartographic patterns. The enthusiasm of the foundation did suffer from this. In its 1963 annual report it wrote that Day’s unit had shown that ‘a properly equipped and designed physical setting staffed with personnel trained to meet cardiac emergencies will provide prophylactic therapy which will materially enhance the survival of these patients and substantially reduce the mortality rates’.

A monitor was bought that enabled the doctors to watch over blood pressure, breath, temperature and pulse of each patient. More important however was the special heart monitor put down in each of the four rooms, connected to an alarm system. These machines - compare the comment of Lown on the importance of technique already existing - were developed in favor of the American space program and had not been ready for use until very recently. This is confirmed for instance in *Aspecten van de Patiëntenbewaking* (Aspects of Patient Monitoring) from the Dutch firm G.L. Loos and Co, published in 1966. The opening sentences are that the space program had ‘highly stimulated electronical

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2 Waitzkin, ‘A Marxian interpretation’, 1265
science. Because of that it is now possible [...] to measure and register a multitude of physiological phenomena.’¹ But, as said, in 1972 Day himself mainly focused on the nursing staff.

Thus, our early concept of the coronary care unit was woven around improving patient care by placing the highly trained nurse back at the patient’s bedside. With close supervision of medical care we hoped to lower the hospital mortality rate of myocardial infarction and salvage patients suffering from unexpected cardiac arrest.²

However, almost at the same moment Meltzer and Kitchell, although commonly seen as the ones who really focused the attention on the importance of a ‘highly trained nurse’, restricted their praise to the technological aspects of the Hartford Care Unit. Almost certainly the explanation for this has to be that they did not have a very high esteem of the nurses role in Day’s particular CCU.

With this equipment it was possible to visualize the electrocardiogram continuously and at the same time for personnel to be alerted instantly whenever the heart rate exceeded or fell below present levels.³

¹ Aspecten van de Patiëntenbewaking, Amsterdam 1966, 1
² Day, ‘History’, 405
³ Meltzer, Kitchell, ‘The development’, 5
Be that as it may, this time the first evaluations did show the success so enormously missed after introducing the crash cart. A mortality drop of twenty percent was ascertained: from 39 to 19. Factually this meant a drop of twelve deaths on 62 patients. A venomous remark at the address of more conservative colleagues was in place.

It is interesting to note that 42 coronary patients were treated by physicians on the general medical floors of the hospital during the first year that the Acute Coronary Care Area was open. These physicians apparently either did not accept the idea of electronic monitoring or felt their patients were not critical enough for the type of care given in the acute coronary area. Eighteen deaths, however, occurred in this group of patients with a mortality rate of 43 per cent.¹

To Day the success of the CCU was self-evident. In a 1965 article on the effectiveness of his unit, he based his findings solely on self observation. No comparison whatsoever was made, not even ‘before and after’. Nevertheless he concluded that the CCU, which, as he mentioned himself, was completely loaded with the latest technological gadgets, was the ideal place for treating patients who had suffered a myocardial infarction.

¹ Day, ‘An Intensive Coronary Care Area’, 424
Electronic equipment can be used with maximal effectiveness. Constant, well trained nursing service is reassuring to the patient and contributes materially to his recovery. The coronary care unit leads to a higher type of medical care and to more frequent visits by the attending physician. The mortality rate of the disease can thus be reduced. The incidence of successful resuscitation in the acute coronary patient, when unexpected cardiac arrest occurs, is much higher than on the general floors of the hospital.¹

Although literature sometimes states that the technological revolution of medicine started the process of actual as well as metaphorical patient-doctor alienation - because the doctor started to give more weight to and see more truth in the figures and statistics of his machines than in the patients tale -² this quotation shows that the CCU was certainly in Day’s eyes an effective weapon against myocardial death. On the wave of this (alleged) success he gave into beautiful prospects. Although the first CCUs had not existed for longer than a year, in 1963 he estimated that spreading them throughout the entire USA could save up to 45,000 lives a year. To underline this estimation in a footnote he first pointed at a personnel communication from Joseph Fitzgerald, senior surgeon, and head of the coronary heart disease unit of the Department of Health, Education and Welfare. However, a footnote a bit further on locates the number back to E. Grey Dimmond, of the Scripps

¹ Day, ‘Effectiveness’, 53
² Cfr. e.g.: Joel D. Howell, Technology in the Hospital. Transforming Patient Care in the Early Twentieth Century, Baltimore/London 1966, 61
Clinic and Research Foundation, La Jolla, California. But because this second reference is also used elsewhere, most likely the first one is the right one. The main point however is that it remains completely unclear on what evidence Fitzgerald or Dimmond based this number. Nevertheless, with or without reference to Day, in the years following it kept returning with peaks up to sixty thousand.

The president of the American College of Cardiology, Elliot Corday, not even hesitated to say that up to 100.000 patients ‘with hearts too good to die’ could be saved by erecting a certain amount of the CCUs. Work at these units was hard and intensive, but also gratifying and, given the results, more than worth all the hardship. This number too would be repeated every once in a while. Pointing at statistics of five different CCUs Meltzer and Kitchell, at a symposium of the American College of Cardiology and their own Presbyterian-University of Pennsylvania Medical Center, claimed that ‘as a result of this care’ mortality in hospitals themselves had dropped by 33 percent. Meltzer and Kitchell certainly were not the least critical cardiologists and so they admitted that there were certain dangers in giving so much weight to such ‘simple statistics’. Nevertheless it was not unreasonable to suggest that if a similar reduction could be reached in every hospital, every year in the USA ‘thousands of lives (perhaps 100.000)’ could be saved.

2 Lown, ‘Intensive Heart Care’, 24
4 Meltzer, Kitchell, ‘The current status’, 4-5
In 1964 the US Public Health Service had published its most recent - positive - data, based on the units of Day and Meltzer/Kitchell. All in all they had examined 300 patients. The outcome was that ‘patients treated in the two coronary care units […] had a mortality about one-third less than the fatality rate expected (or previous obtained) with customary care. Specifically, the mortality among the CCU group averaged 20% in contrast to the former death rate of 30-35%.’ According to the authors almost the entire drop had to be subscribed to signaling ventricular fibrillation on time. This led the Health Service to remarking that introducing CCUs on a grand scale should take place as quickly as humanly possible. If about 1000 of 7000 American hospitals were equipped with them around and about 25.000 extra lives a year could be saved. In later years Meltzer and Kitchell remarked: ‘This optimistic prediction was hardly necessary to encourage hospitals to develop coronary care units; the concept apparently had enough theoretical appeal in its own right so that dozens of hospitals had already initiated this specialized care before any evidence had been presented to justify its value.’

By the way, the reduction by one-third, or in between thirty and twenty percent, would become the most accepted number. Men like Lown or Desmond Julian, Royal Infirmary Edinburgh, would state that

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1 Meltzer, Kitchell, ‘The development’, 8-9
for the time being this reduction had marked the limit of possibilities,¹ a judgment underlined by Dutch cardiologist A.C. Arntzenius in his 1974 inaugural speech Curatieve en Preventieve Cardiologie (Curative and Preventive Cardiology).² However, it certainly was neither the only nor the lowest reduction number mentioned in those years. For instance Meltzer himself would in 1966 come up with a percentage of 40, a percentage again entirely subscribed to CCU-care. And in 1972 Paul N. Yu, Charles K. Friedberg and William J. Grace, professor of clinical medicine of St. Vincent’s Hospital in New York, even mentioned a mortality reduction rate of 50 percent, if the most was made of all the possibilities CCU could offer.³

**Other pioneers**

It will by now be clear that Meltzer and Kitchell were no minor players in the field of coronary care. At the same time as Day set up his unit, they actually were on top of one of the two teams of doctors who independently experimented with different ways to reduce mortality from myocardial infarction. Not reanimation, but investigation into the often fatal heart rhythm disturbances was their starting point. More or less by

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¹ Desmond G. Julian, ‘Coronary Care and the Community’, in: *Annals of Internal Medicine*, 69, 3 (sept. 1968), 607-613, 607; Lown, Coronary and Pre-coronary Care, 718
² A.C. Arntzenius, *Curatieve en Preventieve Cardiologie*, Leiden 1974, 5
accident they had discovered that a large amount of the patients delivered in their hospital suffering from myocardial infarction, suddenly died during hospitalisation.

It was of course common knowledge that people could die apparently sudden after surviving the attack itself. In what rate this happened, was however unknown, and the high percentage amazed Meltzer and Kitchell. Analysis learned that the vast majority of these patients died as a consequence of rhythm disturbances or failing blood circulation, which was scientifically confirmed some years later. That inquiry showed that the existing heart-attack therapy - mainly focused on the prevention of thrombosis embolism - was inadequate. Instead attention should be paid to managing rhythm disturbance. Moreover, most patients died within three days after hospital admittance. That is why Meltzer and Kitchell concluded that heart attack patients should be under constant surveillance during the first days thereafter, in an environment suitable for immediate treatment of rhythm complication.¹

A simple sum taught them the effect would be huge. Each day in the USA almost 10,000 people suffered a heart attack. Of them around and about 1500 immediately died. Of those reaching hospital alive again thirty percent quickly left the land of the living. More than half of them died within the mentioned three day period, and almost all within five days. More than half of the number of deaths was a consequence of

¹ Meltzer, Kitchell, ‘The development’, 5-6; Karliner, History of the Coronary Care Unit, 84
rhythm disturbances, a complication of which Zoll had already proven that fatal consequence was not inevitable.¹

In October 1962 all this led to the erection of a two bed unit in the Presbyterian University of the Pennsylvania Medical Center in order to test the Meltzer and Kitchell presuppositions. The unit was sponsored by the National Institutes of Health. It was completely independent of other medical work and fully self-supporting in matters of staff, equipment and stock. But as in the case of Day’s crash cart, the first results were rather disappointing. Meltzer and Kitchell:

The resident physicians were hopelessly bored with the inactivity and the seemingly endless vigil, and it became necessary to discontinue the effort abruptly to avoid (what now would be called) a demonstration. By default, a system of specialized care was then conceived wherein nurses rather than physicians assumed the primary responsibility for surveillance as well as for emergency treatment. In this plan nurses were taught to assess the patient’s clinical course, identify and interpret rhythm disturbances and, above all, to act on their own if necessary in terminating lethal arrhythmias. This concept, which represented a radical departure from traditional nursing practice, was enthusiastically accepted by the nursing and medical professions and later became the keystone of intensive coronary care.²

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¹ Meltzer, Kitchell, ‘The current status’, 2-3
² Meltzer, Kitchell, ‘The development’, 7
Specially trained nurses had to take over certain medical tasks from the doctors, who were not constantly available. Meltzer and Kitchell hoped that this constant surveillance would not only have a positive effect on the original target, treatment of rhythm disturbances, but also on death subscribed to heart-pump failure.¹

At the same time K.W.G. Brown, R.L. MacMillan and others executed similar experiments in the Toronto General Hospital. They reported their experiences in an article entitled ‘Coronary Unit: An Intensive Care Centre for Acute Myocardial Infarction’, published in 1963 in the Lancet. Brown cum suis reported on their inquiry into rhythm disturbances associated with heart infarct and concluded that more than halve of the patients suffered from them. So they had to be monitored one way or the other. In March 1962, even before Day, they opened a four bed intensive care unit, making constant electro-cardiographical and clinical observation possible in an environment fit for resuscitation.² It was striking that in their first evaluation of the unit Brown sounded the praises of all kinds of things attached to it - it made nursing more efficient; in need all possible aid was available - but did not cheer at all on the raison d’etre of his unit, keeping more patients alive. Dropping the death rate by 36 percent was not achieved, which proofs that also the in later years methodologically fiercely attacked and

¹ Meltzer, Kitchell, ‘The current status’, 4
commonly too optimistic ‘before and after’-research did not always provide the success hoped for. Nevertheless Brown tried to give it a positive turn.

Although the results for the first year in the coronary care unit do not indicate any conspicuous lowering of mortality, vigorous early treatment could possibly reduce the incidence of fatal arrhythmias. [italics mine: LvB]

The word ‘possible’ used by Brown stood not on itself. Words like ‘possible’, ‘probable’ or ‘likely’ were regularly used in articles praising the possibilities of CCUs. For instance in 1965 Day wrote in the American Journal of Cardiology that it was ‘doubtful’ that the results obtained in CCUs could also be obtained in an ordinary hospital room. Lown in 1969 wrote that it ‘seemed’ certain that resuscitation and survival on the long-term had improved because of the CCU. Killipp and Kimball also were of the opinion that it seemed to be abundantly clear that the CCU had improved the efficiency and effectiveness of the struggle against cardiac disease because of the concentration of personnel and technology. And in the three sentences he needed in a 1968 article to describe the blessings of the CCU in combating myocardial infarct, Robert M.

1 Brown, ‘Coronary Unit’, 352
2 Day, ‘Effectiveness’, 51
3 Lown, ‘Coronary and Precoronary Care’, 718
4 Killipp, Kimball, ‘A survey’, 284
Marshall as well used the words ‘appeared’, ‘suggested’, ‘seems reasonable to expect’ and ‘suggest’ once again. It did not stop him from opening his finishing sentence, in which he once more summed up these blessings, with the words: ‘It is clear’.¹

Browns list of CCU-advantages highly resembled the lists Day delivered in 1963 and 1965. Five years later the very same Day rendered the advantages proven. Browns expectations had come through although at the same time Day admitted that in the meantime his first findings and extrapolations had shown to be slightly optimistic. A vast part of early concepts and ideas had been only partly correct but now, by 1968, ‘with further investigation and research’, even higher expectancies were realized indeed.²

The first effectiveness studies
Besides the early CCUs already mentioned one could also point at those of Gaston Bauer and Malcolm Whyte (Sydney Hospital, Australia, 1962). It was a direct result of cooperation with Julian who in 1961, in the Lancet-article ‘Treatment of Cardiac Arrest in Acute Myocardial Infarction’, had proposed to train all nursing and paramedical staff in closed chest resuscitation, after first presenting his CCU-ideas to the British Thoracic Society. Not for nothing the first CCU-presentation was

² Day, ‘Acute Coronary Care’, 252
one of Sydney Hospital given to the British Cardiac Society in 1964.\(^1\)

And then there were Paul Unger, (Miami Heart Institute, November 1963); Grace (St. Vincent’s Hospital New York, June 1964); Sloman (Melbourne 1963); Killipp (Cornell University New York) and of course the one Lown opened (Peter Brent Brigham Hospital, Boston, October 1965). Furthermore all departments in which heart attack patients were delivered had to be equipped with a monitoring system, enabling on the one side automatic registration of heart rhythm and on the other side alarming in the case of rhythm disturbances.\(^2\)

Ungar’s unit by the way was the first one especially built instead of created by rearranging already existing facilities.\(^3\)

The first report from Sydney by Bauer and Whyte at first was rejected by as well by the *Lancet* – because it had already accepted an article by Brown – as the *British Medical Journal* – because ‘it was irresponsible to suggest that all patients with acute myocardial infarction should be admitted to wards in which they can receive intensive care’. Nine months later it was nevertheless published in the *Medical Journal of Australia*.\(^4\)

Meltzer and Kitchell therefore rightly pointed out that not only Day and Brown should get all the credits.

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\(^1\) Julian, ‘The history of the coronary care units’, 498; Mehta, Kahn, ‘Cardiology’s 10 greatest discoveries’ (http://www.ncbi.nlm.nih.gov/pmc/articles/PMC124754/?tool=pmcentrez)

\(^2\) Meltzer, Kitchell, ‘The development’, 8; Khush et al., ‘The history of the CCU’, 1042

\(^3\) Day, ‘History’, 406

\(^4\) Julian, ‘The history of CCU’s’, 498; Khush et al., ‘The history of the CCU’, 1042
Within a period of only a few months in 1962 three independent teams began to treat patients with acute myocardial infarction in specialized facilities designed ostensibly to reverse death from arrhythmias by effective resuscitation. The idea however, was not exclusive and others thinking along similar lines had reached this very same conclusion.¹

Typical for the kind of inquiry into CCU-effectiveness held in these early years of heart monitoring units, was the one by Alan J. Goble et al., Melbourne. In the British Medical Journal in 1966 they published the results of an investigation into the first 150 patients of their CCU. Striking is that admittance policy gave preference to male patients. Combined with the fact that men had a higher risk of falling victim to heart myocardial infarction than females, this resulted in a ratio of 144 men and 6 women. No control group at all was mentioned, not even in time. This was deemed unnecessary because it was a fact that problems were detected earlier and therefore more people would survive, provided of course the medical staff and the machinery was suited to do the job. That of 67 light cases only two died, said it all, according to Goble. Besides the CCU had led to greater awareness on heart and coronary disease in the entire hospital, and this too would, surely in time, have a positive effect on the death rate. His conclusion therefore was plain: ‘A coronary care unit is an important factor in reducing mortality from

¹ Meltzer, Kitchell, ‘The development’, 7-8
myocardial infarction. Such units should be established in all large hospitals dealing with acute cases.”

Although critique on this kind of investigations, of which the conclusions in fact were merely assumptions, was not heard for long, it never disappeared nor did the certainty of its conclusions. For instance the investigation of W.H. Langhorne in 1970 on ‘three years experience in a community hospital’-CCU without full time staff or director, was devoid of control groups too. Nevertheless it was clear to Langhorne that the positive results were the same as those reached in CCUs of big medical centres, like it was certain as well that mortality had dropped in his CCU by one third as a consequence of installing the unit.

This however cannot take away the fact that these inquiry’s were typical especially for the early CCU-years. By opening the first CCUs a concept was born for which superlatives had yet to be invented. They at least were a very great, if not by far the greatest contribution of the sixties concerning the treatment of acute myocardial infarct. Day typified the decennium as ‘the era of the cardiologist with the defibrillator in his hand!’ But not all left it with that. In the eyes of the one the CCU was nothing less than a very positively valued revolution in medical pract-

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4 Day, ‘History’, 406
tice,¹ for others it marked the most significant step forward in hospital practice of the sixties in general.² Lown, who looked upon the unit as a unique development, a great therapeutic innovation and a ‘key advance in cardiology’,³ did not want to limit his praise to CCU alone, but put on a pedestal all those, from Beck to Day, who in the past decennia had contributed to the ‘momentous advancement’ in the care of heart patients. But that this praise, very realistically but nevertheless a bit strange, immediately was followed by the statement that total death as a result of heart disease nevertheless had not dropped at all,⁴ shows that the advance had not been that great. It looks a bit like the athlete who has tried all the technological and – no doubt legal - pharmaceutical stuff available, says it made him stronger and better than ever, but nevertheless clocks exactly the same time as he always did.

¹ Grace, Keyloun, ‘Coronary Care Unit’, 18
2 Growth and Prosperity of the CCUs

Although later on the applauding entrance of the CCU turned out to be a bit premature, this does not mean it was not understandable at the time, because the effects Day and others subscribed to it were wondrous. Moreover the effects were published at times attention for the heart, that life giving muscle, was already at a peak. On the one hand this resulted from the Framingham-study. It had shown absolute as well as relative growth of heart and coronary disease. On the other hand there was the spectacular and world wide admired heart operations for instance of the Amsterdam cardiologist D. Durrer in 1965 or - and above all - the South African Christiaan Barnard in 1967. In combination this led to an unparalleled triumph, not failing to draw the attention of the ones involved. In 1972 Meltzer and Kitchell said that only very few medical inventions were accepted as swift as the CCU. ‘Even before there was any evidence to indicate that the plan of care was actually effective in its purpose [ital. LvB], units were being developed in centers throughout the world.’

Within five years after the opening of the first CCUs already 350 other hospitals in the United States had installed similar installations. And within six years, according to Khush et al., ‘virtually every community hospital in the United States and Canada had either established a formal CCU or had designated several beds for the specific care of patients with AMI’. Furthermore a recommendation was issued to all

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1 Meltzer, Kitchell, ‘The development’, 8
hospitals with 100 beds or more that they should have a CCU in the near future as well. And indeed, in 1974 80 per cent of all American 300 bed general hospitals had a CCU at their disposal.\(^1\) Contrary to many of their medical colleagues, to whom the blessings of the CCU were a fact that did not need to be discussed,\(^2\) Melzer and Kitchell were critical. This quick acceptance and introduction, which did not limit itself to the United States but was a world wide phenomenon, had taken place without any real scientific proof ‘to indicate that the plan of care was actually effective in its purpose’. In other words, introduction had taken place without the availability of articles ‘which actually define the true benefit of this system of care’.\(^1\) Karliner would endorse this nine years later.

From an historical standpoint, the acceptance of coronary care as an integral part of the medical management of patients with acute myocardial infarction was an exceedingly rapid event. [...] [The CCU] and, indeed, other types of intensive care units such as the Respiratory Intensive care Unit, have gained relatively uncritical acceptance by the medical profession. In this sense, the best analogy is to a surgical procedure which is initially accepted and subsequently undergoes a critical review with a controlled trial. By contrast, the establishment of such units is unlike the acceptance of a new drug

\(^1\) J. Fracheboud, Hartinfarct. Hartbewaking of thuisblijven?, Utrecht 1987, 14; Khush et al., ‘The history of the CCU’, 1042
\(^2\) Cfr. e.g.: Grace, Keyloun, ‘Coronary Care Unit’, 19
which must undergo a critical evaluation in controlled trials prior to general use. [...] Its uncritical acceptance still remains a matter of some controversy.²

The faultfinders Karliner refers to in his last sentence had truth at their side from a scientific point of view. Although, as said, also studies published some years after the introduction of the first ‘inquiries’, in which presuppositions, no more than confirmations of assumptions, were presented as facts,³ the first reports with death rate drops of percentages in the dozens, could hardly be called scientific. At worst they were no more than personal observations, and at best mortality of a certain number of heart patients before introduction of a CCU was compared with an equal amount nursed in the unit.⁴ This was rendered sufficient. The experience of the doctor was abundant proof. In 1968 Kimball and Killipp wrote that their experience in treating patients in a CCU had made clear beyond any doubt that aggressive and professional use of anti-rhythm disturbance medication on the one side and electronic apparatus on the other, was enough to lift the danger of passing away as a

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¹ Meltzer, Kitchell, ‘The development’, 8; Meltzer, ‘Current policies and results’, 3
² Karliner, ‘History of the Coronary Care Unit’, 83, 85-86
consequence of arrhythmia.\(^1\) Or as CCU-protagonist Sylvan Lee Weinberg put it in 1969: ‘Consistent experience has documented the efficacy of this approach.’\(^2\) Even in 1998 G. Hugenholtz, heart specialist of the Rotterdam Dijkzigt Hospital, could still get annoyed when hearing words as ‘evidence-based medicine’.

As if we ever did something else! People defending such an approach, forget that a doctor also takes with him things as professional experience, as patho-physiological knowledge in his clinical actions. It is precisely this combination that, makes him a doctor. […] Modern cardiologists should prevent whatever the cost that ‘evidence-based medicine’ gets the scientific measure. Or else the profession of doctor will cease to exist!\(^3\)

Beside the fact that randomised trials, introduced in the medical world shortly after World War II,\(^4\) were often considered to be too expensive - although there was enough money for investments and in the seventies randomised trials were seen as budget cutting measures, preventing unproven innovation - many doctors regarded them unnecessary as well. For death as a consequence of rhythm disturbance was calculated

\(^1\) John T. Kimball, Thomas Killipp, ‘Aggressive Treatment of Arrhythmias in Acute Myocardial Infarction: Procedures and Results’, in: Progress in Cardiovascular Disease, 10, 6 (mei 1968), 483-504, 503
\(^2\) Weinberg, ‘The current status’, 262
\(^3\) P.A. Doevedans, F. Willems, Wijzers in de cardiologie, Amsterdam 1998, 11
\(^4\) Osler L. Peterson, ‘Myocardial Infarction: Unit Care or Home Care?’ , in: Annals of Internal Medicine, 88, 2 (febr. 1978), 259-261, 259
at 100 percent. In other words, every patient the defibrillator draws back over the Styx meant beating Hades. To see this scientific proof was not needed.¹

Shift of attention

Nevertheless the lack of scientific proof that CCUs indeed were effective, is probably one of the reasons that, in spite of all the ballyhoo, attention within the CCUs had shifted a number of times within the 10 years before Day as well as Meltzer and Kitchell cast a historical eye on its development. Or: that CCUs were effective was seen as a fact, only the way in which technique and personnel would best be used for the hail of mankind, was open for discussion. In this context it is not necessary to take the importance of the CCU as a place for research into consideration. For how great this importance has been or is, and how much knowledge it has brought on the functioning of the heart,² even the greatest defenders of the concept thought this to be a mere by effect. ‘In the final analysis, the CCU is designed to improve survival of the patient suffering from acute myocardial infarction’, Kimball and Killipp would write in 1969.³ It was exactly because of this that in 1975 Geoffrey Rose would say that defending the CCU-concept by pointing at knowl-

¹ Interview E. Dekker, Amsterdam 10-8-2000
² Cfr. e.g.: K.I. Lie, Acute Myocardial Infarction in the Coronary Care Unit. Factors influencing its immediate prognosis, Amsterdam 1974, 1, 70
³ Killipp, Kimball, ‘A survey’, 284
edge gained - a fact hardly to be denied - was wrong. Knowledge in itself does not save lives.¹

Resuscitation was followed by prevention of heart rhythm disturbance or other complications, a concept especially defended by Lown. This in turn was followed by attempts to treat ischemic heart disease and pump failure. This however, according to the protagonists, was not the consequence of an Odyssey searching for the Ithaca of proper CCU-use, but the result of attempts ripened through experience to save even more lives in a CCU than it already did.² By the way: ischemic heart disease is the name for oxygen deficiency in the heart as a result of coronary stricture. Therefore this treatment at least meant that the CCU lived up to its name a bit more.

As mentioned earlier, in the first few years after the erection of the first CCUs all attention focused at reanimation and early detention of possible rhythm fatal disturbances. In general the procedure in one CCU did not differ from that in another. The greatest difference was in the measure of responsibility handed over to the nursing staff. In this early stage, it was first of all discovered that the number of rhythm disturbances due to acute heart-infarct was even greater than thought. In a 1964 study of Julian, A. Valentine and G.G. Miller no less than 95 out of 100 cases were described with some kind of disturbance. 56 of them

were potentially life threatening. Although it was the first time such an amount was measured, and although also following studies, for instance by Meltzer and Kitchell, did not come up with such high percentages, all the investigations showed that rhythm disturbances were not to be underestimated, neither in numbers nor in severity.¹

Through time it became increasingly clear that the nurse was the key to success. According to Killipp and Kimball for a positive effect the special CCU-nursing teams were of even greater importance than the technological equipment.² Without special training of and handing over responsibility to nurses, making it possible for them to take decisions based on their own knowledge and observation, the CCU would be no more than an empty shell, be it a flashy and expensive one. Just installing pretty machines was useless if not accompanied by investing in specially trained personnel, capable of handling these machines and interpreting correctly the numbers and statistics they came up with. Because this was one of the first times nursing personnel was given greater responsibility by entrusting them with specialized tasks, the development of the CCU has been pictured as a milestone in the history of emancipation of the nursing profession.³ The pioneers in the field of specialized nursing teams, Meltzer and Kitchell, in 1966 pointed at the

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¹ Meltzer, Kitchell, ‘The development’, 8
² Killipp, Kimball, ‘A survey’, 281
great success of ‘their’ system and ‘how remarkable competent nurses have proved themselves’.¹

However, without doubting the truth of this observation, it has to be said that according to others this development was no more than handing over in essence medical, but in practice rather simple and boring activities to lesser and therefore cheaper personnel. According to these criticizers this fits perfectly in the trend of simplification of medical labour. Machines took over work, and data and statistics put aside thinking. ‘The deskillling process applies [...] to CCUs and other intensive care facilities, where standard orders - often printed in advance - can deal with almost all situations that might arise’, Marxist Howard Waitzkin said.² Be that as it may, it is certain that every process of emancipation following a shift of responsibilities has nothing to do with a wish for emancipation in itself. Fitting in a trend or not, handing over responsibility was a practical solution for a practical problem. The emancipating effect was merely a coincidental consequence.

**The problematic judgment of effectiveness**

It was soon discovered that success in combating ventricular fibrillation, seen in about 10 percent of CCU-patients, in the units too, was completely dependent on the cause. If fibrillation was a primary complication of an infarct, defibrillation almost always was successful. If however, ventricular fibrillation, combined with advanced failure of the

¹ Meltzer, Kitchell, ‘The current status’, 4
² Waitzkin, ‘A Marxian interpretation’, 1266-1267
left ventricle, was secondary, treatment rarely had any positive effect. Therefore fighting death in a CCU was considered possible only in the case of primary ventricular fibrillation. Therefore, in the early years of CCU-development attention focused almost completely on this.\(^1\) The electrical pacemaker hardly played a role in treating primary fibrillation. One expected much of the apparatus. Consequently as a matter of routine on arrival in a CCU a patient almost always got electrodes put on the chest and almost all observation installations received equipment stimulating the heart from outside the body in case of cardiac arrest. But research learned that all this was life saving in just a few instances. In 1967 Lown even concluded that ‘the external pacemaker is ineffective and an unnecessary encumbrance within a coronary care unit’. The consequences for the pacemaker were not very pretty. It was eradicated from standard equipment.\(^2\) After the failure of the crash cart, the rejection of the pacemaker again proved that expectancy and technology alone, are not always sufficient for long term and wide scale introduction, as, so we will see, has been said by critics, taking for instance the CCU as example.

Lown’s article closely related to the starting-points of Meltzer and Kitchell. It tried to show that the main focus in a CCU should be rhythm disturbance. This would often make resuscitation superfluous. However the ‘proof’ he presented again only was the result of a ‘before and after’-investigation. In none of the many articles Lown cited there

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\(^1\) Meltzer, Kitchell, ‘The development’, 9
\(^2\) O.c., 10
was talk of some form of randomisation, how ever small. By the way, also Lown’s CCU was financed by the Hartford Foundation, but this time the government, more specifically: the US Public Health Service, cooperated. And there was a third investor: commerce and industry. The American Optical Company put in some money but on the condition that it was to fabricate the much used ‘tape-loop recall memory system’.¹ This has had some implications, but more on that later.

Lown’s article led to a CCU-conference in 1967. The lectures presented were printed in the American Heart Journal. The conference was financed by the Department of Health, Education and Welfare and applauded the wide scale spread of CCUs, although at the conference itself on several occasions it was remarked that effectiveness of the units still was not proven beyond any reasonable doubt. For instance, the head of the Heart Disease Control Program of the Public Health Service said to the audience:

An attempt was made a few years ago to make some controlled studies of the benefits of CCU efforts, but it was not possible to carry out those investigations for many reasons, some of them fiscal. Therefore, we do not have proper studies for demonstrating the advantages of CCUs. But now that these opportunities and occasions to prevent heart rhythm disturbances have become a great deal more common, we can be assured that our efforts are worthwhile. [...] Upon advice of our colleagues in the profession, we

¹ Waitzkin, ‘A Marxian interpretation’, 1261
have not considered it ethically acceptable, at this time, to make a controlled study which would necessitate shunting of patients from a facility without a CCU (but with the support that CCUs provide) to one with a CCU.¹

So, the effectiveness of the CCU was not proven, it was plain that it would be effective and therefore randomised inquiry in search of proof was unethical. This argument again and again would return as criticism on more or less randomised inquiries carried out in later years, and as a reason for not doing randomised research oneself. In connection with this Alain C. Enthoven in his *Health Plan. The Only Practical Solution to the Soaring Cost of Medical Care* (1980) - in which he pointed a couple of times at intensive care units in general and CCUs in particular - raised the subject of the ‘home versus hospital’-inquiry of the British doctor H.G. Mather in the beginning of the seventies, more treated in depth later on. In this partly randomised research the treatment of heart infarct patients at home and at a CCU incorporated hospital was compared. After a few months the first evaluation was made. It turned out that death in hospital was, although slightly, greater than at home. Shortly after Mather’s British colleague A.L. Cochrane reported an incident of a doctor making notice of Mather’s inquiry to a CCU-protagonist, but accidentally turning the figures around, making home the more deadlier environment.

¹ Idem.
[The physician] immediately declared that the trial was unethical and must be stopped at once. When, however, he was shown the table the correct way round he could not be persuaded to declare CCUs unethical!

In 1973 two of the - very rare - CCU-criticizers, Bernard Bloom and Osler Peterson, went in depth into the argument that when effectiveness was clear, research was unethical, a reproach the Dutch cardiologist K.I. Lie also hit when trying to look into the effectiveness of the anti-arrhythmia ‘miracle drug’ lidocaine in a randomised way. Lie, together with the two already mentioned cardiologists Dunning and Durrer, the Dutch participant in the international heart- and CCU-debate, discovered that although lidocaine certainly had some positive effect, it also had a lot of by effects often severe, that certainly outside protected CCU-environment could proof to be worse than the ailment itself. On top of that, although the number of patients with ventricle fibrillation dropped, mortality itself did not. Bloom and Peterson ascertained that many doctors thought, or better: knew, that a CCU just had to be effective because of the many interventional possibilities it gave. But alas, they remarked, merely a possibility to intervene says little to nothing

1. Alain C. Enthoven, Health Plan. The Only Practical Solution to the Soaring Cost of Medical Care, London/Amsterdam 1980, 6
2. Lown, ‘Intensive Heart Care’, 24
about the result actual interventions have. Therefore they concluded that randomised inquiry into the effectiveness of costly medical care, such as the one delivered in a CCU, could not be put aside as unethical. For it was as unethical to spend precious, limited amounts of money on care of which the effectiveness was not proven, if that money also could be spend in another way effective indeed.¹

However, in combination with the recommendations already made, the conceptions put forward at the 1967-conference on the effectiveness of CCU-care, proven or not, made that this conference certainly contributed to the unparalleled CCU-triumph Meltzer and Kitchell observed. Supported by government and private foundations the call for more CCUs grew louder and louder, despite the lack of scientific proof of effectiveness and despite the questionability of the idea that such inquiry was unnecessary, even unethical. In 1967 in the US 24 percent of all hospitals were equipped with a CCU. In 1974 it was almost 34 percent.² When looking at large hospitals alone, the number, as said, was even 80. This seems rash, no, it is rash, but compared to some other countries it is not even that rash. Take the Netherlands. In that - small, thickly inhabited - country the first two CCUs were installed in 1965. In 1967 number three followed. After that the number exploded to 55 percent of all hospitals a mere four years later, a percentage reached in the

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² Waitzkin, ‘A Marxian interpretation’, 1261
US not until the beginning of the eighties.¹ In the final chapter we shall go into the Dutch example more thoroughly.

In the early stage of CCU-care it turned out that it had little effect on life or death as a consequence of other complications of heart infarct, outside rhythm disturbance. Meltzer and Kitchell noticed that it had been immediately clear that ‘constant surveillance and preparedness did not influence the death rate from advanced left ventricular failure, cardiogenic shock, thromboembolism or ventricular rupture’.² By lowering the percentage of death as a consequence of arrhythmia, the number of deaths as a consequence of other complications automatically rose. Within a couple of years in the USA in case of a heart attack left ventricular failure and cardiogenic shock as cause of death rose from 40-50 percent, up to 80 percent.

The inability to combat (power) failure also made it apparent that earlier reports (in the pre-coronary care literature) indicating that vasopressor (or any other) therapy had succeeded in lowering the awesome mortality of cardiogenic shock to 50% were not correct. Experience in coronary care units soon showed that nearly 90% of patients with this latter complication died and there was no predi-

¹ Dirk Soeters, Unpublished manuscript on Dutch CCU’s, copy in possession of the author, 3
² Meltzer, Kitchell, ‘The development’, 10
cable effective method of treatment available; indeed, the situation was even more grim than had been supposed.¹

¹ Idem
3 A Second Phase in CCU-development

From treatment of rhythm disturbance to prevention

The almost certainly most important discovery in early CCU-years, in which everything within the unit was focused on keeping the patient alive the first critical days after admittance, was that primary ventricular fibrillation and primary ventricular arrest seldom came spontaneously. They were introduced by minor disturbances. This ushered in the second phase of CCU-development.

When it was clear how to keep these minor, non-lethal disturbances in harness by medication and internal stimulation, the main focus of CCU-care shifted from reanimation to prevention of life-threatening disturbances. Lown explained in 1966: ‘Resuscitation, even when successful, represents a failure - a failure of anticipation and a failure of prophylactic therapy.’ Lown stood not alone in this. Almost simultaneously with him ventilating his wish to focus on prevention, the first criticisms on CCUs focusing on reanimation were heard. An ‘Editorial’ in the Journal of the American Medical Association, January 1967, stated that, although up until that moment CCUs had resulted in ‘some decrease in the number of electrical cardiac deaths’, survival percentage after resuscitation in the long term still was ‘a distressingly low 38%’. And in May 1968 Kimball and Kitchell too gave way to some disap-

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2 Meltzer, Kitchell, ‘The development’, 10
pointment on the results of early CCUs.\textsuperscript{2} So the question was raised if CCUs could not have a greater and longer lasting effect if they were used in a different way. Would prevention not be more effective than resuscitation, a question Lown answered positively with all his heart. Only by making prevention the main target of CCUs, he argued, their possibilities could be used in full. If used in such way, he predicted a 30 percent decline in mortality in patients with acute myocardial infarction.\textsuperscript{3} That Lown cheered this development is not surprising, for his CCU had had ‘prevention’ as a motto right from the start, a choice he considered completely justified after a year. So it was about time other CCUs shifted policy as well.\textsuperscript{4}

However, it were not just CCUs shifting policy. The start of the period of prevention, the start of a period of aggressive, drug supported treatment, also marked the beginning of the definitive breakthrough of the CCU-concept. It was a breakthrough that, in the words of Kirsten Fleischmann and Thomas Lee, transformed the unit ‘from an extraordinary level of care available at only a few hospitals to a new standard of care available at major hospitals across the United States’.\textsuperscript{1} And, so one can add, in many other parts in the world, thinking back at the Dutch example given above, where the expansive growth of the amount

\begin{itemize}
\item[3] Lown, ‘Unresolved Problems’, 494, 507
\end{itemize}
of CCUs also dated from 1967 and where the preventive concept of Lown served as a shining example.

Whether it was the result of development of CCU-environment; the greater experience of doctors and/or nurses with aggressive, instead of reluctant treatment invented already at the end of the fifties; or because of the effect of medication such as lidocaine – which shows that not only the development in certain technologies, but in medication as well had its influence on CCU-development -, fact is that death caused by rhythm disturbance was seen less and less. Because of this attention once again shifted. The focus now was laid on mortality as a result of advanced left ventricular failure. One tried to discover its early signs, together with those of cardiogenic shock, because in cardiologist’s eyes this also had marked the beginning of success in combating arrhythmia. They succeeded with the help of X-rays, which made it possible to foresee certain signs of failure, even before physical, clearly visible signs were present. However, the next step, from diagnosis to preventive treatment, turned out to be much harder. Different propositions were made, but, as Meltzer and Kitchell put it, ‘no substantial evidence could be presented to confirm or deny the value of any one plan. The choice of treatment was actually determined only on a philosophical or intuitive basis.’

It would like this until the moment research at heart-catheterization right after the infarct, an operation considered very risky at the time, would give enough physiological data on the history

1 Fleischmann, Lee, ‘The evolution’, 3
2 Meltzer, Kitchell, ‘The development’, 10-11
3 O.c., 12
of complications. It was not until 1970 before a satisfactory way to collect the necessary data was found: the Swan-Ganz catheter. But even then hardly any noticeable result could be produced. And so the so-called third phase, the phase of combating left ventricular failure, in 1972 was still in its infants, the same year in which Meltzer and Kitchell presented their history of CCU-development.¹

Extension of intensive care in time
This however does not mean that the search for reductive measures of death caused by heart- and coronary disease, was stopped. All kinds of different CCUs were presented, mainly focusing on the biggest problem of CCU-care: only those reaching a unit alive could profit from the care given. A vast amount of so-called delay-factors made that many had already passed away before reaching hospital. Amongst them: the time passed before patient or family were convinced of the seriousness of the situation and called for their general practitioner; the time passed before the practitioner was in place; the time passed before the practitioner decided more intensive care was needed, or the time passed before an ambulance was in place and back in hospital. Because of all these different factors the time between attack and admittance not seldom was at least half a day. Reducing this delay was considered to be of great importance, even more so because the assumption in the first CCU-period - most patients die within 48 hours -, was only partly correct. In general, death even occurred in the first few hours after the at-

¹ O.c., 13, 15
tack, and therefore in many cases before a unit could be reached.¹ This again means that, even if a CCU in practice would produce a vast intramural reduction of mortality, the effect on society as a whole would still be negligible, a fact in 1979 once again brought forward by the critical, British Working Group on the Development of Coronary Care in the Community.²

Moreover, it was discovered that mortality reduction of CCU-care in many cases did not mean a long-term farewell to death. It turned out to be just a short-term delay of deceasing, or, for the cynics amongst us: a prolongation of suffering.³ After having been transferred to a normal ward, some four of five days after CCU-admittance, many patients died as yet. This meant that, even if death in a CCU dropped, death in hospital as a whole stayed all but the same. This however did not lead to questions with regard to the definitive effect of CCU-care itself, but to an attempt expanding in time the kind and intensity of care given in a CCU in a forward as well as in a backward direction. After man had gone to the machine, now the machine had to be brought to man again, and to stick with him as long as possible.

² Fracheboud, o.c., 17; Lie, *Plotselinge hartdood*, 4
³ Meltzer, Kitchell, ‘The development’, 15
In trying to counter the delay-factors, several measures were taken such as lowering the threshold to hospital and CCU. For instance patients suspected of having had an infarct, although it was not yet certain, were now admitted to a CCU as well. While trying to make a more definitive diagnosis they were treated as if the infarction had been reality.\(^1\) This so-called ‘rule out-phase’ had much in common with pre-coronary care, a concept blooming on the upcoming notion that, although called ‘sudden death’, death by infarct seldom really was sudden. Most of the patients dying shortly after a heart attack had had a history of heart disease and many of them had been visited by a doctor just recently.\(^2\) Beside all the measures taken in the rule out-phase, pre-coronary care also tried to let patients profit from all the technology a CCU had to offer without actually admitting them into the unit. ‘Continuous telemetric monitoring of high-risk patients as they go about their daily task’, as Lown put it.\(^3\) Pre-coronary care would be a concept enthusiastically accepted in some countries, but rejected in others,\(^1\) showing the importance of time and place on the acceptance of medical innovation.

The best known measure taken as a consequence of the pre-coronary care concept is the Mobile Coronary Care Unit (MCCU). By reshaping an ambulance into a CCU on wheels - or building especially designed new ones -, again staffed by specially trained medical and

\(^1\) Fleischmann, Lee, ‘The evolution’, 3  
\(^2\) Julian, ‘Coronary Care and the community’, 612  
\(^3\) Lown, ‘Unresolved problems’, 507
nursing personnel, one hoped to considerably reduce the time between infarct and specialized care, hopefully leading to a substantial reduction in mortality, at an individual level as well as in community as a whole. The MCCU was baptized on 1 January 1966 in Belfast, soon followed by one in Moscow. The first messages were extremely positive. In this, at least in the USA, the same mechanism as with the CCU some years before, started working. The concept was received enthusiastically and soon, once again before any serious scientific evaluation had been undertaken let alone available, MCCUs were, in the words of Meltzer and Kitchell, ‘in operation in many communities. […] The concept was further enlarged in the next few years to include permanent “life-support” stations at industrial sites, factories and even football stadiums.’

The MCCU would assure that for the first time in history death outside hospital as a consequence of myocardial infarction could be beaten. It would solve all the delay-factors with the exception of calling for aid by patient or family, and therefore considerably shorten that delay. It was seen as the ideal solution for the risk always attached to transporting heart patients to hospital and because of it later complications would stay at bay so influencing hospital death positively.¹

But the enthusiasm of many could not silence the critical voices of some. In 1968 Julian, although certainly no adversary of intensive heart care in general, was willing to admit that mobile care could lead to

some reduction of mortality, but it surely would be a very costly reduction. Equipping ambulances with specialized personnel would mean an enormous attack on hospital finance. In his view this money was better spent on research leading to greater reduction on the long term.\textsuperscript{2} Michael F. Oliver, working in the CCU of Edinburgh Hospital, underlined this critique. He too foresaw problems in staffing of and paying for MCCUs. Furthermore it perhaps could lift some of the delay-factors, but indeed not the so-called patients-delay, which happened to be the most important one by far. Moreover, in his view a CCU could only have effect if it could indeed deliver at a CCU the patients entrusted to it. This however would certainly not always be the case, quite the contrary.

At present we are doubtful whether there is a sufficient case to be made out for the development of many of these ambulances and it is certainly true that their possible benefits must be related to the cost and availability of medical and nursing personnel.\textsuperscript{3}

According to J.S. Geddes, author of ‘Twenty years of pre-hospital coronary care’, critique like this, combined with the CCU-critical research by men like Mather and J.D. Hill (on whom we come to speak later on), ‘undoubtedly’ has ‘delayed the recognition of the value of pre-hospital care’.

\begin{footnotes}
\item\textsuperscript{1} Pantridge, Geddes, ‘A Mobile Intensive care Unit’, 271, 273; ‘The Care of the Patient’, 23
\item\textsuperscript{2} Julian, ‘Coronary Care and the community’, 607
\item\textsuperscript{3} Oliver, ‘The place’, 50-51 (quotation: 51)
\end{footnotes}
care’ although, when criticizing the relevance of the Belfast-data, it was ‘overlooked […] that the relevant evidence supporting the value of pre-hospital care was derived from a comparison of the outcome for patients seen and treated early with that for patients first seen after a longer delay’.1

The Intermediate Coronary Care Unit (ICCU) - also called ‘step down unit’ or ‘after-care ward’ - was intended to provide for care on a CCU-level further away in time. Grace would be the greatest protagonist of this concept.2 It incorporated a lengthening of care by a week or two in another ward on a level only somewhat less intensive as in CCU itself. According to Meltzer and Kitchell the few inquiries into the concept at the beginning of the seventies had been promising. In any case this prolongation of intensive care had brought to surface the probable cause of post-CCU mortality in hospital. Rhythm-disturbance, a problem all but solved in CCU itself, merrily raised its head after dismissal.

These data, if typical and representative, would suggest that the vast majority of late hospital deaths are arrhythmic in origin. This has not been proved thus far but there is some circumstantial evidence to foster this belief.3

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1 Geddes, ‘Twenty years’, 492
3 Meltzer, Kitchell, ‘The development’, 16
ICCU not only delivered lengthened care, but also provided the solution of a problem partly caused by MCCU: the shortage of CCU-beds. After all there was and is a tension in healthcare between care as good and as long as possible and care as much as possible, a tension felt as well between optimal care for a small amount of people and sufficient care for many. This tension was at the heart of CCU-controversy, and it made the units unqualified for giving ICCU-care itself. The consequence of this practical problem combined with the again high expectancies of ICCU on lowering mortality, was that - the story becomes monotonous - a great number of ICCUs was put into practice without any real scientific investigation into their effectiveness, with the exception of a few, indeed positive, ‘before and after’-inquiries. So, as had been the case with MCCU, criticism reared its head.

This criticism strengthened when, at the beginning of the seventies, the first more or less randomised ICCU-trial showed no significant difference in mortality between ICCU-patients and patients admitted to a normal hospital ward. It is true almost twice as many people in ICCU were successfully resuscitated as in hospital ward (from respectively 25 and 41 patients, 46 and 22 percent, or 12 and 10), but the number of patients actually going home after a while was all but the same, even slightly in favour of the ward (4 out of 12 in ICCU and 5 out of 10 in the ward.) So again one could not talk of survival but only of death’s delay.

With some feeling for understatement in 1977 in the Journal of the American Heart Association Leon Resnekov stated:

\[1\] Julian, ‘Coronary Care and the community’, 609
It would be hard to conclude that an ICCU had any dramatic impact on in-hospital mortality of acute myocardial infarction from this particular study, even admitting flaws in its design.¹

Moreover, in 1976 the *American Journal of Cardiology* published the result of a ‘before and after’-investigation by Weinberg, again not a CCU-adversary at all. He had compared the years 1969-1970, when his CCU had to do without ICCU, with the time after it was introduced, 1971-1972. He mentioned specifically that the two groups were all but the same in composition. Nevertheless his inquiry gave no reason whatsoever to be very cheerful about the ICCU-concept. So Resnekov saw no proof of any ICCU-advantage. Typically enough, as we shall see in case of critique on CCU itself, he did not conclude out of this that the ICCU-concept should be abandoned and hospital ward-care was at least as good, but only that the care given should be even more intense and longer and that the ICCU should become even more mingled with CCU-care, which, according to him, was effective for a fact. A further advantage was that this would lead to lowering the pressure on the available amount of CCU-beds.²

² O.c., 1697-1698
Growing doubts

At the end of the sixties and the beginning of the seventies this ‘although, nevertheless’-opinion of Resnekov concerning CCU, ICCU or MCCU was shared by many internists and cardiologists. For instance, already in 1967 Oliver, Julian and Kenneth W. Donald gave vent to it. During the great CCU-conference they pointed at several problems in evaluating CCU-effectiveness. Nevertheless they concluded:

Certain facts are clear. Coronary care units have shown that cardiac arrest is normally the commonest single mode of death, that the resuscitation rate is high compared with elsewhere and it is probable that cardiac arrest in many cases can be prevented. We consider, therefore, that, where possible, all patients should be admitted to coronary care units. [ital.: LvB]

We have already seen that propositions and probabilities were magically transformed into facts and conclusions, and again here, too, one can ask how words like ‘facts’ and ‘probable’ can go together so smoothly.

A year later Oliver added that general agreement was reached. CCUs had succeeded in reducing death by myocardial infarction, some-

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thing also noticed by Kimball and Killipp around the same time.¹ Yet it was and remained the ‘good-risk’-patient for whom most could be done. Besides, CCU-effectiveness had shown to be greatest in a younger population, there had been changes in admittance policy of hospitals since CCUs had been established and more patients with myocardial infarction had been admitted to hospital simply because of the existence of a CCU. So although on the one hand it looked as if it was the same group that benefited from treatment and on the other hand it was clear that there were substantial differences in patient population before and after CCU-erection, nevertheless the conclusion of Oliver was in accordance with other inquiries: experience learned that mortality could be reduced by a quarter.²

Again, one year later, in 1968, I. Donald Fagin and R. Rajagopal published their ‘before-after’-investigation, in which, surprisingly enough, hardly any difference in mortality from myocardial infarction before, and after CCU-installation was seen. However, what was ascertained was that mortality from cardiac arrest after installation had dropped. This sole fact justified CCU-introduction, although it had not been the sole reason. Summing up their findings, they added that they had not been the only scholars failing to find high mortality reduction

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² Oliver, ‘The place’, 47-48
figures, but ‘despite our relatively unimpressive statistics to date, we believe that the unit has been a valuable addition’.\footnote{I. Donald Fagin, R. Rajagopal, ‘Mortality from Myocardial Infarction Before and After Establishment of a Coronary Care Unit’, in: \textit{Journal of the American Geriatrics Society}, 16 (1968), 908-918, 908, 917}

Like Oliver, Lown in 1968, discussing the matter with CCU-sceptic Arthur Selzer, just wanted to let facts speak for themselves. Although, again: see Oliver, this did not withhold him from taking the words ‘to appear’ into his mouth, he was of the opinion that ‘frequently ill-founded opinion’ stood no change against the evident logic and simple facts of intensive coronary care.\footnote{‘Controversies’, 597} But only one year later even he wrote that there had been so much differences in diagnostic criteria in establishing myocardial infarction - composition of investigated populations, the time that went by before admittance into CCU, in therapeutic action and presented data - ‘that no final conclusions are as yet possible’. But this could not in the least change or even shade his CCU-opinion.

The CCU constitutes an optimal hospital environment for the patient with acute myocardial infarction. It has already lowered mortality for the hospitalized patient with acute myocardial infarction. It has enhanced education and has upgraded the responsibility of the nurse. It has provided an environment conducive to investigation of a number of challenging problems. It is changing the practice of medicine by promoting a system of care continuously guided by monitored changes in patient response. However, the most im-
important contribution emerging from the CCUs is the demonstration that sudden coronary death can be prevented.\(^1\)

And to end this list, in their historical overview Meltzer and Kitchell sum up some of the critical remarks made on the CCU-concept, especially on the investigations undertaken so far, but, so they continued, none of these remarks ‘[can] really deny or even challenge the value of coronary care: they simply emphasize the essential requirement of the system: the need to initiate care as soon as possible after the attack’.\(^2\)

Partly this conviction will have to be subscribed to the opinion of not the least amongst CCU-protagonists, namely that scientifically there was nothing wrong whatsoever with ‘before-after’ investigations, nor with knowledge solely based on experience and observation. In his discussion with Selzer, Lown openly asked how one could possibly come up with another explanation for the ‘fact’ - the results of the Fagin and Rajagopal investigation were not yet known - that mortality had been around thirty percent before introduction of the CCU and twenty thereafter. This just had to be a consequence of coronary care.\(^3\) In 1969, Killipp and Kimball summed up a number of positive conclusions of such-like inquiries, clearly trying to implicate that it was impossible that all these scholars could be wrong.\(^4\) Closely linked with this is the conviction of the same three, Killipp, Kimball and Lown, that a randomised

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\(^1\) Lown, ‘Coronary and Precoronary Care’, 718, 720
\(^2\) Meltzer, Kitchell, ‘The development’, 18
\(^3\) ‘Controversies’, 598-599
\(^4\) Killipp, Kimball, ‘A survey’, 284
trial would be extremely difficult to execute. According to Lown it was almost impossible to set up adequate control for CCU-care, because it knew so many different components.\(^1\) Killipp and Kimball added that such a trial would hardly be free of prejudice, because everybody with a history of heart disease would want to be admitted to a CCU.\(^2\) Strangely enough, these considerations did not make them doubt conclusions drawn from investigations far less scientific than a randomised trial.

**‘The’ CCU does not exist**

A number of the remarks made above and the fact that some of Lown’s remarks came from a controversy, clearly show that at the end of the sixties criticism on the CCU-concept slowly came to the fore. What did this critique imply and did it have a practical or an ideological nature? That for a great part the criticism was practical, is shown by the fact that also some of the protagonists began to get some doubts, either against the concept itself, against the methods of investigation, or against the conclusions drawn out of these investigations. For instance Killipp himself pointed at the fact that results obtained in one CCU, said little to nothing about results that could be obtained in a CCU yet to be erected. From community to community delay-factors differed and also differences in age- and sex of the community surrounding the unit were of great importance.\(^3\) But the patients of different hospitals could them-

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1. ‘Controversies’, 598
3. O.c., 285
selves differ enormously as well, not only as a consequence of the just mentioned differences in the surrounding community, but also as a result of differences in admission policy and speed of admittance or discharge. For instance the average age of patients in the Royal Infirmary-CCU at Edinburgh was 57 years, Hammersmith Hospital 58, Peter Brent Brigham Hospital 64 and in New York Hospital no less than 70.¹

But those differences were not only due to external factors. CCUs could differ in size, number of beds, surrounding hospital, technical equipment or personnel composition and expertise. In other words, although it was the CCU one mainly talked about, one can easily state that the CCU did not exist. In the aforementioned Aspects of Patient Monitoring it was written that a CCU could be installed not only complete, but also ‘in a basic form [or] a more elaborate form’.² In 1970 the Japanese firm San-Ei Instruments advertised for CCUs in either two- as four-bed size.³ And in 1983 Lee Goldman described the first CCUs as little more than some beds put together with an electrocardiographic monitoring device in between.⁴

In 1968 Selzer and Oliver almost simultaneously split up CCUs into four categories. The most simple form of CCU, class IV, only had one or two beds, an oscilloscope for each bed, and a defibrillator. This system became increasingly popular. This was not without danger, according

¹ Oliver, Julian, Donald, ‘Problems’, 467-468
² Aspecten patiëntent bewaking, 6
³ Patient Monitoring System. Coronary Care Unit – Intensive care Unit, Tokio 1970, 16-19
to Oliver mainly because it created an entirely false feeling of safety amongst patients as well as medical personnel. The technological equipment was not extensive enough and staff seldom thoroughly trained. He even concluded: ‘These systems may cause more trouble than good; because they are cheap, they may be adopted as a simple although naive attempt to keep up with the demands of the community.’

In the second form a number of beds were put together in a ward and electrocardiograms were read on a central oscilloscope. In the eyes of Oliver this was a huge progress, all the more because the central monitor was read by staff that was well trained to do so. Misinterpretation or false alarm occurred far less. The disadvantage was, however, that patients were often and intensely confronted with the (often deadly) misery of other patients. This would, to put it mildly, not improve their well-being and it could lead to causing the problems the CCU was erected to prevent. The coronary care unit turned into a coronary scare unit; the heart monitoring unit into a heart disordering unit.

The third form of CCU, class II, tried to solve this problem by combining the central monitoring with the patients individual interest. It existed of separate rooms with technology in the patient room as well as in the central hall. According to Oliver these units started to have some positive effect on mortality, and, between the lines, it was not before this form of CCU that according to him and Selzer one could truly speak of a CCU.
The fourth and most advanced form, class I, existed of at least a class II CCU, but incorporated in an intensive care department. Furthermore, in this unit care was combined with research. This lead to a unit combining the advantages of a class II unit, combined with cost reduction because of shared use in CCU and intensive care department of staff and technology needed in both. ‘Moreover’ said Oliver, ‘accommodation in such areas can be flexible - a considerable advantage in view of the variable demands on coronary care units. The development of general intensive care areas with a coronary component would seem to be the most satisfactory direction for the future.’

Be this as it may, it does not mean that the problem of false alarm and misinterpretation was limited to CCUs class III and IV with minimally trained personnel. And cost reduction was certainly not always the result of a class I CCU. O. Secher for instance detected a perhaps understandable tendency amongst some doctors for purchasing good looking monitoring equipment ‘and what to do with them is surely a secondary consideration’. And in 1970 H.S. Wolff, of the London Division of Biomedical Engineering, said that still a lot went wrong in CCUs, partly due to growing pains of the apparatus, partly due to unfamiliarity of medical and nursing personnel with the machines and the data they delivered, and partly due to over sensitivity of the machines, that often reacted to minimal, insignificant signs of a patient: false alarm. On the other hand, it also occurred that the apparatus did not

1 Oliver, ‘The place’, 49-50; ‘Controversies’, 600
react although the signs were anything but insignificant and minimal. Wolff concluded that ‘the use of alarms triggered by a marked increase in heart-rate, only picked up 35% of crises and that the addition of blood-pressure measurement only picked up a further 10%. It is thought that it will be difficult to improve this performance until circuits capable of recognizing specific dysrhythmias become available.’

In the beginning of the seventies this was endorsed in a Dutch Heart and Coronary Disease Project, set up amongst others by the Ministry of Public Health. In it three different programs of vector cardiogram analyses were compared. Because of different causes error messages lay between 30 and 51 percent.

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4 Medical critique on the CCU-concept

Effectiveness critique

The second point drawing the attention of CCU-critics is the inquiries into CCU-effectiveness during the second half of the sixties. As said, their scientific nature was doubtful, to put it mildly. Already in September 1967 Grace had put to the fore that in all research investigating myocardial infarction, it was unclear what the researchers exactly meant by it. This not only greatly decreased their value but also made it impossible to compare investigations.¹ One month later Brown and MacMillan ventilated their doubts. One had to be very careful distilling a positive trend out of the several inquiries, as has been done. There simply were too many uncontrollable variables.²

But it was, again in October 1967, Julian, Oliver and Donald who really opened the attack on CCU-investigations - an attack later repeated by Julian alone - although this could not change their positive opinion on the units itself. One could raise questions regarding the measure of effectiveness, and so they did, but, Julian said in 1968, that the units had a positive effect was made abundantly clear by now.³ Although according to him and his two companions, on the whole agree-

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¹ William J. Grace, ‘Mortality Rate from Acute Myocardial Infarction – What are we talking about?’, in: American Journal of Cardiology, sept. 1967, 301-303
³ Julian, ‘Coronary Care and the community’, 608
ment was reached on how a CCU should look like, there still were major differences in admittance- and discharge-policy leading to great differences in mortality - the quicker one admitted, the greater mortality. This seems paradoxical, because the quicker one admitted the greater the chance of survival should be. But by waiting the patients with a really serious problem had already died, leading to a greater percentage of survivors in the CCU itself. This resulted in major discussions about CCU-effectiveness compared to conventional methods, and in serious doubts concerning the influence of a CCU on community mortality. Furthermore, the admittance- and dismissal-policy was dependent of the goal one wanted to reach when taking a CCU into action, a goal for instance differing between university hospitals and local hospitals. This goal too had to be incorporated in the evaluation of effectiveness, so possible differences in outcome could not be ascribed to differences in method, as apparently sometimes happened before.1

Thereupon Julian, Oliver and Donald undertook a study into several kinds of scientific research on CCU-effectiveness and concluded that not one of them really came up with any real evidence. In all of them the uncertainties were too big. This meant that experience gained in one CCU concerning death from myocardial infarction could not be compared with experience gained in other CCUs. The units simply differed too much in goal and societal role. Also data coming from a comparison of a hospital including a CCU with a hospital of comparable size, place and goal but without a CCU, turned out to be unreliable.

1 Oliver, Julian, Donald, ‘Problems’, 465, 467, 469
Precisely because one of them did and the other did not have CCU-technology at its disposal, research results drifted too far away from each other. In other words: one and the same patient could be diagnosed differently in each and every hospital. A difference however slight in diagnostic criteria could already lead to huge differences in mortality figures. In the eyes of Julian, Oliver and Donald comparing CCU-mortality with hospital mortality in general was invalid as well, because ‘claims that patients admitted to coronary care units are unselected are not acceptable’. Pre-selection will have taken place, be it unintended. Moreover, concentrating experienced and trained personnel in the CCU could have a negative effect on death in the surrounding hospital, which holds for admittance policy as well. There could have been a tendency towards admitting non-severe cases into CCU as well to gather proof for its effectiveness, cases that normally would have been cared for in the general ward and would have survived there as well. By admitting those cases into CCU, positive survival rates in the CCU (and negative death rates in the surrounding hospital) became a self-fulfilling prophecy. And last but not least: comparisons of mortality-rates in a CCU with mortality-tares before CCU-introduction, were meaningless as well, considering that death-rates could vary from year to year in the same population and environment and even within one and the same hospital, without anyone being able to point at one or two factors that were responsible for this. The same goes for patient population which could differ strongly every year from time to time. This too will have had its effect on mortality figures. Installing a CCU further-
more could change the complete admission-policy leading to entirely different patient populations before and after installation. By a swifter and more ample admittance of ‘good risk’-patients the good results of a CCU could again turn out to be no more than a self-fulfilling prophecy. Moreover, mortality often only after a while showed a declining tendency, suggesting that good CCU-results had more to do with personnel gaining experience than with technology.¹

Julian, Oliver and Donald did not stay lone rangers for long. Together with Bloom in 1973, Peterson pointed out that in none of the ‘before and after’-inquiries populations had been exactly comparable, although this was essential for the validity of the outcome of such an inquiry.² Two years later, Geoffrey Rose added that evaluation of CCU-performance was almost impossible because even the most simple data could not be delivered that were, however, indispensable for an evaluation. Data on age, time of admittance, gravity of the infarct: they all were absent. And thus, remarking that the growing admittance of less and less ill patients - hospitalisation - had caused death in hospital staying at the same level since 1960, although the number of admitted patients had increased considerably, was nothing but a hypothesis he could not proof. But it certainly was one applicable to CCUs. By con-

² Bloom, Peterson, ‘End results’, 76-77
tinuously admitting the less severe ill, of course mortality-percentage will drop. But this says next to nothing about the real effectiveness of the units.

As word gets around of advances in hospital care, it is natural for general practitioners to respond by sending more patients, particularly perhaps the milder cases previously thought not to justify hospitalisation.¹

Rose was very frustrated that data could only seldom be delivered, neither by the American Ministry of Health, nor by the CCUs themselves, and differentiated data were even more absent. There was in other words a serious lack of evidence concerning a medical development of considerable value, to say the least. To a certain extent this lack of proof was completely unnecessary. The bigger CCUs only had to analyse their data concerning the above mentioned categories and compare them with the same data from hospitals without CCU. Surely this evaluation would be less trustworthy than a randomised trial, ‘but it would be much better than nothing’. Now ignorance and indecision were the result, for instance in the case of hospitals and general practitioners, when confronted with the question whether a patient was to be transported to a CCU or not. Although Rose was convinced that at least a small part of the relative decline in mortality - the rise of patients ver-

¹ Rose, ‘The contribution’, 147, 148; Richard Taylor, Medicine out of control. The anatomy of a malignant technology, Melbourne 1979, 111
sus the equal amount of deaths - had to be subscribed to intensive coronary care, on account of this he nevertheless passed a harsh judgment on (the inquiries into the effectiveness) of the CCU.

These units are large consumers of scarce resources, and there needs to be firm evidence of substantial benefits in order to justify their position. At present this evidence cannot be available because the relevant data have not been reported.¹

In his discussion with Lown, Selzer too got into the inaccuracy and unscientific character of the ‘before and after’-research and he too pointed out that at one time a large number of serious cases could enter hospital followed by a period of time during which this was much less the case. Or: a decline in mortality is not necessarily the consequence of technological innovation, such as a CCU, carried out in between those periods.² In fact, Selzer added, endorsing the aforementioned critique, the problem of non-comparability only grew after CCU-installation.

The availability of such a unit may encourage the inclusion of patients with questionable or milder forms of the disease who in the past might have been treated at home. Series of cases in a coronary care unit thus may be preselected when compared with another series of cases of more rigidly defined myocardial infarction.³

¹ Rose, ‘The contribution’, 147-150 (quotation: 148)
² See also: Hofvendahl, ‘Influence of Treatment’, 11
³ ‘Controversies’, 600
To strengthen his criticism Selzer presented data Grace had given in his ‘Mortality Rate from Acute Myocardial Infarction: what are we talking about’, published in 1967 in the *American Journal of Cardiology*. In two successive periods (January 1965 to September 1965 and October 1965 to March 1966) about one hundred patients suffering from myocardial infarction were treated (103 and 98). Although the treatment itself had been exactly the same in the first period 16 percent had died and in the second no less than 35. Selzer commented:

> It does not require imagination to visualize that if the order of these two periods were reversed and if, between one period and the other, a coronary care unit were introduced in this hospital, these figures would be used to prove the success of the unit.¹

Because of this kind of criticisms, a couple of years later Lockhart Mc-Guire and Margaret Kroll would suggest that comparing mortality was an improper instrument for measuring CCU-effectiveness, although mortality reduction precisely was the goal for which the units were called into being.²

In the beginning of the seventies criticism became still harsher because the ‘unethical’, more or less randomised trials carried out for in-
stance by Mather or Stefan Hofvendahl of Serafimer Hospital in Stockholm, made available new, although quite differing figures. In their 1977 ‘Pitfalls in Evaluating the Impact of Coronary Care Units on Mortality from Myocardial Infarction’, Leon Gordis, Lechaim Naggan and James Tonascia criticized all the CCU-research carried out up until that moment, not only the research done in the sixties but also the later, certainly better, ones. Nevertheless the conclusion was clear and reason enough to put some firm questions regarding the swift introduction of the CCUs: the more elaborate the research, the less the researchers could come up with demonstrable CCU-success.\(^1\) On top, they showed that relying on not very scientific research was not typical for the early CCU-years alone. A judgment of the Commission for Heart Disease Control in 1972 showed the same lack of scientific attitude and scepticism. It implied that the reduction of mortality in hospitals was entirely due to the introduction of CCUs. Amongst the five inquiries presented as proof, according to Gordis, Naggan and Tonascia, none could pass as scientific, although at the time there certainly were some available that were. This was the umpteenth proof that the rise of CCU had more to do with ‘a wave of zeal and enthusiasm’ than with ‘any objective data demonstrating their effectiveness’.\(^1\)

Some time later one more critical soul, the aforementioned Waitzkin, would join up with Gordis and his companions, although he would

limit himself, when shooting his in typical seventies Marxist poison drenched arrows, to the kind of research Day had undertaken. He too pointed out that all the claims regarding spectacular mortality drops were anything but based on research worthy to be called scientific. And he too wrote that as soon as in the beginning of the seventies the inquiries became more serious of character, the up until that moment all but positive image became more diffuse at the least, and sometimes even was completely shot to pieces.²

So, although also the research of Mather and Hofvendahl encountered some criticism - especially the one by Mather, the one, contrary to Hofvendahls, doubting CCU-effectiveness - they certainly made clear that the data of certain inquiries in the past were not as valid as supposed. Like Rose,³ according to Peterson and Benedict J. Duffy, Mather’s surely valid inquiry had delivered definitive proof that intensive heart and coronary care was not the technological magic bullet it was in the eyes of Day and Lown. According to them, the conclusion Mather draw from his 1971 inquiry - ‘this interim analysis suggests that a randomised comparative trial of the efficiency of domiciliary treatment versus hospital intensive care is a proper and ethical study’ -¹ were sooner to be called modest than bold. Besides it was a relief compared to ‘the uncritical acceptance of coronary care units as effective therapy’.

¹ Gordis, Naggan, Tonascia, ‘Pitfalls’, 287
² Waitzkin, ‘A Marxian interpretation’, 1261
³ Rose, ‘The contribution’, 149
Treatment in these units is very expensive when compared with normal hospital treatment or home care. Obviously, before embarking upon new and costly treatment it would be wise to first assure that they will produce the results that are widely assumed.\textsuperscript{2}

This not very encouraging outcome of Mather’s research and later on the research done by Mather’s countryman Hill - who undertook some research into mortality in a CCU compared with hospital ward nursing - kept on intriguing Peterson. The history of medicine, he wrote in 1978, gave numerous examples of medication and methodology that, although at first viewed with some reserve, were embraced quickly because they were held responsible for some highly positive tendencies seen after introduction. However, after a while and after some critical overview the results often appeared not that spectacular at all or were even completely absent. Peterson therefore chose sides with Rose who, in an article on intensive coronary care, had commented that such examples even were the rule rather than the exception.\textsuperscript{3} Perhaps apart from the reserve at the start, more and more CCU developed into yet another example of this history repeating itself. It is noticeable that even the more serious inquiries followed this so-called Strauss-curve, named after Maurice B. Strauss who had presented it in 1940 looking at the introduction of medication. For example, not only the Hofvendahl-study,

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\item \textsuperscript{1} H.G. Mather et al., ‘Acute Myocardial Infarction: Home and Hospital Treatment’, in: \textit{British Medical Journal}, 7-8-1971, 334-338, 337
\item \textsuperscript{2} Peterson, Duffy, ‘The CCU’, 510
\item \textsuperscript{3} Rose, ‘The contribution’, 147
\end{itemize}
but the almost simultaneously executed research of Ib. Christensen et al. at Municipal Hospital Copenhagen as well - on CCU-care compared with hospital-care on an empty bed basis - had shown positive CCU-result. However, when Hill copied this latter research the positive effect had vanished into thin air. Hence Peterson kept inclining towards giving value to the outcome of Mather’s research - being looked after at home or at a CCU was six of one and half a dozen of the other - no matter how much criticism it had received.¹

Likewise, Hill and his companions criticized the bulk of CCU-research and criticized that, in spite of Mather’s research, also in the United Kingdom CCU had started its triumph. This probably was, according to Hill, partly the result of a 1975 recommendation of the so-called Joint Working Party of The Royal College of Physicians of the British Cardiac Society. Although aware of Mather’s research and CCU-critique this group of British cardiologists had come to the unanimous conception that patients suffering from a recent heart attack could best be moved towards CCU by MCCU. Home care certainly was an alternative but only for patients being medically examined at a fairly late stage, who seemed to be in a rather good disposition. At the same time, this same Joint Working Party admitted that, for instance due to financial or architectonical reasons or because of a simple lack of personnel, it was in British hospitals not always possible to get the best from CCUs. But:

¹ Peterson, ‘Myocardial Infarction’, 259-260
‘much can be achieved by enthusiasm and improvisation’.\footnote{J.D. Hill et al., ‘Comparison of Mortality of Patients with Heart Attacks Admitted to a Coronary Care Unit and an Ordinary Medical Ward’, in: \textit{British Medical Journal}, 9-7-1977, 81-83, 81; ‘The Care of the Patient’, 26, 40} This however could of course be a fairly optimistic view on the effect of phantasy and simple hard work, which would at least partly explain why British research into CCU-effectiveness was often rather differing.

Hill could only turn away his head in shame at such a recommendation. Since the introduction of the first CCUs in Great-Britain, death as a result of myocardial infarction in the community as a whole had not declined at all. Proportional decline in hospital could only be ascribed to the admittance of less severe cases in average. No randomised trial whatsoever was executed into the effectiveness of CCUs and in comparative studies, mostly groups were compared that differed too much to give any value to the outcome. On top most of the inquiries, that were still referred to when proving CCU-effectiveness, were at least ten years old. The results of those inquiries did not necessarily say anything about CCU-effectiveness in the middle or late seventies.\footnote{Hill, ‘Comparison’, 81} Contrary to Geddes, Hill probably will have welcomed the fact that the Department of Health did not follow the recommendation of the Working Party completely by saying that the development of mobile coronary care should not be encouraged. It even, according to Geddes, ‘placed an embargo on the extension of schemes of advanced training for ambulancemen’.\footnote{Geddes, ‘Twenty years’, 492}
Following the criticism the methodology of the sixties inquiries received, more and more questions were raised regarding the mortality reduction data they delivered. In a 1970 CCU-evaluation Andrew Klaus pointed out that in the five CCU-investigations he looked at, percentages varied from forty percent reduction up to even a slight increase. And when classifying these figures all unity for sure was lost completely. He of course summed up the customary explanations for the great variety in data - difference in the kind of CCU, difference in level of personnel training - but immediately added that he tried to include these differences. Even then one could still not detect any consistent pattern.\(^1\) Even Meltzer and Kitchell, although convinced of CCU-effectiveness, in 1972 - the same year in which Grace and his colleagues still came up with a possible mortality reduction of 50 percent - had to admit that little to nothing could be said on the level of effectiveness. The only thing that indeed could be stated was that the earlier reported effect probably was overrated, and therefore the figure of 40 percent Meltzer had himself proclaimed in 1967 as well.\(^2\)

This discussion was nourished further by the Dane K. Astvad in 1974, when executing a ‘before and after’-inquiry, a methodology up until that moment one of the pillars under CCU-enthusiasm, let alone a few exceptions. However, he was unable to detect even the slightest mortality difference. On the contrary: the 41 percent death in CCU turned out to be a tiny bit higher in comparison with mortality before

\(^2\) Meltzer, Kitchell, ‘The development’, 17
CCU-installation.\textsuperscript{1} This research was even more remarkable because, as said, shortly before other Scandinavians, Hofvendahl and Christensen, executed some more or less randomised trials that showed substantial advantages of intensive coronary care. And this again contradicted the outcome of comparable trials done by Mather and Hill in Great-Britain. The riddle of true CCU-effectiveness became greater and greater.

**CCU-costs**

A third, off and on indicated point of criticism was felt more and more as the sixties reached their end. Slowly it became clear that economic growth had reached its peak and CCUs were a major drain of financial possibilities. Although Julian, Oliver and Donald admitted that it was almost impossible to measure the cost of a CCU per life saved, especially considering the fact that they did not know how many (or even if) lives in a CCU actually were saved, already in 1967 they concluded that it was unmistakable ‘that the full resources of the most sophisticated coronary care units cannot be made available to the whole community of patients suffering from acute myocardial infarction without an unreasonable diversion of financial and professional resources from other medical fields’.\textsuperscript{2} One year later in his discussion with Lown Selzer added that perhaps financial problems within the United States would remain within certain limits, but these same United States were held up

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\textsuperscript{1} K. Astvad et al., ‘Mortality from Acute Myocardial Infarction Before and After Establishment of a Coronary Care Unit’, in: \textit{British Medical Journal}, 23-3-1974, 567-569, 567
\textsuperscript{2} Oliver, Julian, Donald, ‘Problems’, 472
\end{flushleft}
as an example to other nations. In these nations financial resources often were a lot smaller. So one had to be very careful spreading the idea that only a hospital including a CCU could provide responsible, modern heart care.\(^1\)

Without explicitly mentioning CCU-technology, in 1971 David B. Gilbert, in his article ‘What Possible Use can Computers be to Medicine’ remarked that as far as he could see the attitude of doctors towards modern technology had drastically changed during the sixties. At the beginning of that decade waiting conservatism was the rule, while ten years later every new gadget was greeted with lots of ballyhoo and enthusiasm, for it again would be a certain step forwards in the direction of a medically bright and shiny future. But this future would not only be glorious, it would also be very expensive. For this reason, procuring a CCU had often been possible only with the help of grand donations of private persons or foundations and only seldom there had been some sort of cost-effectiveness justification. Nevertheless one kept hoping that in the end computers would have a cost and time reducing effect, a hope Gilbert believed would be idle.\(^2\)

In that same year Hofvendahl in his mentioned CCU-article tried to nuance this judgment. Although admitting that especially highly trained personnel was costly, he still believed that all in all the cost increasing effect of this would be minimal. It is remarkable is that he based this judgment on a very recently opened seven bed CCU while

\(^1\) ‘Controversies’, 601
\(^2\) David B. Gilbert, ‘What Possible Use can Computers be to Medicine’, in: *Archives of Internal Medicine*, 127 (jan. 1971), 96-98, 96
his research had been done in the before going three bed unit. He had finished his research at the moment the new, expensive unit was installed, in September 1968. This possibly has led to pressure on interpretation and extrapolation of the data gained, data not published for three years after closure of the actual inquiry. For these data, if in the slightest way possible, had to justify replacement by a larger and more expensive unit. Ascertaining after taking into use the seven bed unit that in time this would lead to a reduction of two nurses - and a number of other in any rate economically positive consequences - therefore has to be qualified as a very rash conclusion at the least and perhaps even as no more than wishful thinking. Moreover, this ascertainment was hardly in line with a remark further on in Hofven-dahl’s article. One nursing day in a CCU was about twice as costly as a nursing day at a normal hospital ward,¹ a calculation endorsed by Fleischmann and Lee in 1998. Although accompanied by some ‘howevers’ and ‘buts’,² in this they showed remarkable restraint. In 1974 a researcher of the Brookings Institution, Louise Russell, had estimated this ratio as one to three at best. Combined with the fact that at that time four to five percent of all hospital beds were placed in intensive care departments such as the CCU, intensive care alone led to an increase in expenditure of almost ten percent, or, nominally spoken, about 2.6 billion dollar. Enthoven commented that although technology

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¹ Hofvendahl, ‘Influence of Treatment’, 69, 74
² Fleischmann, Lee, ‘The evolution’, 4
could not be accounted for this huge sum entirely, it certainly had played a major role.¹

CCU-critics like Bloom and Peterson had come to this conclusion already. In their ‘End Results, Cost and Productivity of Coronary Care Units’, published in 1973 in the New England Journal of Medicine, they wrote that consumer price index between 1950 en 1968 had increased ‘only’ 45 percent, while hospital costs had tripled. According to them CCUs unmistakably had contributed out of proportion to this increase.² This conclusion was underlined by Astvad who one year later showed that since CCU-introduction mortality of lung oedema had stayed at an even level, while cost of treatment had increased by almost fifty percent.³ And in their study on Stanford University hospital, Palo Alto, ‘Changes in the Costs of Treatment of Selected Illnesses’ (1977), A.A. Scitovsky and N. McCall wrote:

Of the conditions covered in the 1964-1971 study, the changes in treatment in myocardial infarction had their most drastic effect on costs. This was due principally to the increased costs of intensive coronary care units. In 1964, the Stanford Hospital had a relatively small Intensive care Unit (ICU). It was used by only three of the 1964 coronary cases. [...] By 1971, the hospital had not only an ICU but

² Bloom, Peterson, ‘End results’, 76
³ Astvad, ‘Mortality from Acute Myocardial Infarction’, 568
also a Coronary Care Unit (CCU) and an intermediate CCU. Of the 1971 cases, only one did not receive at least some care in either the CCU or the intermediate CCU.¹

Bloom and Peterson in 1973 criticized CCU-growth, amongst other reasons, because it had taken place without considering things like effectiveness, need or cost. They were for instance established in hospitals not in need of a CCU because neighbouring hospitals already had enough CCU-capacity to fill the need of the surrounding community. They probably were introduced anyhow, exactly because neighbouring hospitals had one as well. So Bloom and Person made a point of establishing CCU according the need of a certain region instead of individual hospitals. This could increase effectiveness and at the same time lower the costs. However, to achieve this it was necessary that decisions on installing high-technology such as a CCU, were no longer left to hospitals alone. ‘Excess capacity and ineffectiveness will result. These decisions must be made by bodies that are more disinterested and have a broader view than that of a single institution.’²

After an inquiry in Massachusetts Bloom and Peterson concluded that a more well-considered system of regional CCU-spread could reduce the number of units and beds from 94 and 446 (data from 15 January 1973) to respectively 39 and 336. In spite of this reduction, everybody could still reach CCU within half an hour. The chance there

¹ Quoted from: Waitzkin, ‘A Marxian interpretation’, 1265
² Bloom, Peterson, ‘End results’, 72, 76-77 (quotation: 77)
would be an empty bed was no less then 95 percent and the cost reduction would be 3 million dollar annually per region. The average CCU-size would grow, having the advantage that mortality probably would decrease since earlier investigations seemed to have proven that mortality in small CCU’s was higher. However, this was anything but certain because, as usual, patient groups had differed. What was certain though was that in a large CCU the average price per patient was lower than in small ones. So Bloom and Peterson concluded that ‘there are too many units of small size to be efficient and with too few patients for optimal effectiveness’.¹

According to them it had to be perfectly clear that the value of intensive care was established before introducing such a unit. Cost and effect had to be compared.² Peterson:

The data from the Bloom and the Martin studies [see below, LvB] leave little doubt about the costliness of intensive care of patients with myocardial infarction. It is discouraging that these expensive services and their increasing application have taken place without regard to efficacy, much less to their costs.³

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² Bloom, Peterson, ‘End results’, 76-77; Peterson, ‘Myocardial Infarction’, 260
³ Peterson, ‘Myocardial Infarction’, 260
In the footsteps of Ivan Illich, technology-critic Richard Taylor four years later, in his *Medicine out of Control*, wholeheartedly agreed. Asking the question ‘intensive care or expensive scare?’ he set forth that intensive care was expensive, but wholly inefficient care, and the CCU was the best proof for this. Money a community had to pay for health care should be invested there where it could do the most good and not ‘fed into the empires of those who are most adept at fabricating a “need”’. Like Peterson, he added that neither conviction nor experience, but proof should be the foundation of medical innovation. Conviction without proof had little to nothing to do with science but more with religion and in the eyes of Taylor religion could never justify the spending of billions of dollars that would have done a lot of more good when invested elsewhere.¹

A possible explanation for this gross increase in cost partly due to expensive (CCU-)technology, had been given by Samuel Martin in 1974. He pointed out that contrary to general economics, the consumer could not in any way influence supply and demand of medical facilities. The doctor determined both hospital visit (demand) and treatment (supply). As a consequence, the other players on the medical market could only marginally influence the price of medical care. In fact, the price was determined by the medical player alone, and he of course was inclined to do more and more tests and collect more and more data on a continuous basis, in an increasing pace, on an increasing number of patients, and using the latest, most sophisticated kind of technology. Of course,

¹ Taylor, ‘Medicine out of control’, 112, 118, 119
Martin added, all this happened only in the patient’s best interests, or that was at least what was claimed, but this does not imply that it actually turned out to be in the patient’s interest.

Some inputs, in addition to their financial impact, have the ability to produce illness. Hospitalization, laboratory testing, and medications, for example, can produce morbidity above that of the disease being treated and its financial burden.¹

CCU and death in the community
One more question raised with regard to CCU-effectiveness concerned its influence on total mortality, following from the observation that even in the years the most terrific stories about CCU-mortality reduction were heard, general mortality kept on rising as it would be doing up until the end of the sixties. Even if mortality not only within CCU but within hospital as a whole could and would be reduced, that did not mean that mortality in the community as a whole dropped as well. Perhaps a certain number of patients surviving within hospital would have survived outside hospital as well, causing an intramural mortality reduction but at the same time an extramural increase, even if the

¹ Samuel Martin et al., ‘Inputs into Coronary Care During 30 Years. A cost effectiveness study’, in: *Annals of Internal Medicine*, 81, 3 (sept. 1974), 289-293, 289, 291-293 (quotation: 293); In an effort to control the costs of the introduction and use of new medical technology, the American National Institutes of Health introduced the Technology Consensus at the end of the seventies. See: J.C.M. Jonkman, ‘Wat is nut en haalbaarheid van medische
amount of attacks stayed the same. If this was the case, CCU would be a very expensive investment indeed. On top of this in 1968 Julian again remarked that only a small percentage - at most ten percent, he thought - was actually admitted in a CCU. So influence upon total mortality just had to be marginal. Therefore, he pleaded in favour of lowering the threshold of admittance, increasing the speed still further and replacing patients of whom after 48 hours it had become clear that the greatest danger was over, from CCU to a surrounding with less intensive nursing care, be it ICCU or even common ward.¹

Furthermore, and not without importance, around 1970 it had become clear that in the years CCUs were installed in the US, there had been no reduction whatsoever in the mortality of the white, male population.¹ This implied that, if there had been a mortality reduction, this had to be ascribed completely to a reduction in the black and/or female population, exactly the two groups in US-society going through a process of emancipation. This again meant that reduction could not, or at least not entirely, be ascribed to a technology like the CCU, which was in principle sexually and racially neutral.

In 1976 CCU-critics like Astvad and J. Lindholm were all too happy to acknowledge that a CCU could have a marginal effect on mortality as a whole, as a consequence of resuscitation of patients who otherwise would have died. But they were as happy to remark as well that this

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¹ Desmond G. Julian, ‘Coronary Care and the Community’, in: Annals of Internal Medicine, 69, 3 (Sept. 1968), 607-613, 607, 608-9
would probably be the case for other sick and wounded too if they would receive the same kind of intense treatment heart patients got in a CCU. Moreover, they as well pointed out that effectiveness of a CCU could not only be measured by looking at the number of lives that were saved, but also at how long they were saved. For instance the inquiry of Gordis and his colleagues in Maryland looking at the condition of heart and coronary patients one year after dismissal, had shown that in the mean time more than thirty percent of those treated in a CCU had died, and ‘only’ eighteen percent of those treated outside CCU. Noticeable in their research was that within CCU difference in male and female mortality was twenty percent - in female advantage - against an extramural six percent. A difference was also seen between whites and blacks in black advantage -, but this difference was too small to be of any statistical value. Although provided with the necessary scientific nuance, their overall conclusion, that apparently people treated outside CCU had a greater chance of long-term survival than within, could hardly be called a recommendation for CCU.

Lindholm and Astvad made their comments in a time that overall death of myocardial infarction was declining. This raised the question whether, and if so: in what measure, this could be attributed to the widespread introduction of CCUs. In 1979 Michael Stern tried to formulate an answer. He, too, in an article again loaded with scientific nuance, pointed at the enormous inaccuracy that could result from com-

1 Meltzer, Kitchell, ‘The development’, 18
2 Lindholm, Astvad, ‘Coronary Care Units’, 673
3 Gordis, Naggan, Tonascia, ‘Pitfalls’, 287, 290
paring two groups of patients, if these groups were not exactly similar. Even the slightest difference in patient population could lead to huge differences in mortality percentages. In other words: much of the CCU-research done so far was all but useless. This meant that on the influence of a possible decline in hospital mortality on overall death from myocardial infarction, a lot could be said indeed, but not much of it would truly be sound. Maybe that as a consequence of societal and medical attention for heart and coronary disease, lots of patients in earlier days not admitted into hospital, nowadays did find their way into it. This could cause a decline. However, because of this, a lot of not severely ill will have reached CCU-care as well, who would have survived anyway. Again, this would lead to hospital mortality reduction, but without having any significant effect on societal mortality. Because of all these doubts and questions Stern’s conclusion concerning the influence of CCU on the established overall decline of myocardial infarction, was all the more astonishing and surprising and gives reason to follow the criticism of Peterson and Taylor who said that doctors looked upon CCU in an anything but objective manner, a way much more linked to ‘believing’ than ‘knowing’.

Although the evidence is mixed, I conclude that coronary care units have probably contributed to the ischemic heart disease mortality decline. This conclusion is based principally on the evidence [...] that risk factor changes probably account for only a portion of the overall decline, and the evidence [...] that emergency medical ser-
vices and coronary bypass surgery have *probably* contributed little, if at all, to the decline.¹ [ital. LvB]

In other words: because other factors could not explain the decline either, the explanation just had to come from CCU-influence.

It was anything but convincing. Furthermore, it did not reason away that, however great reduction of mortality within CCU was, first of all not only overall mortality still was huge, so was CCU-mortality. And secondly: mortality before CCU-admittance and after CCU-dismissal remained high.² And so, taking all this together, it was not surprising that Goldman, on account of the CCU’s twentieth birthday, asked himself in an article in the *International Journal of Cardiology* whether the units really had delivered a substantial contribution to mortality decline, or if they just had been expensive innovations with minimal effect.¹ These remarks were further fed because, as already hinted at, a number of researches in the seventies had shaken the positive sixties story, certainly when a longer term was taken into consideration. CCU-resuscitation had saved many (wo)men’s lives, but in most cases survival turned out to be short. Although he did remark that practically speaking it would be a tough job to set up a randomised

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trial, which, contrary to those of Mather and Hill, would be of such a magnitude that the results would be really convincing, Goldman completely failed to understand why a trial into mortality inside and outside CCU or hospital, was considered unethical by many experts.\(^2\) For if researchers like Mather and Hill were right, no life saving therapy was withheld from the patients. To the uncertainty resulting from conflicting data was added the certainty that most patients did not die within a day after the attack, but already within a few hours. So even with an enormous reduction of the delay-period many patients would not reach CCU-care in time. About seventy percent of the ones dying after an attack already would have passed away before they could have profited from some form of serious medical treatment. This again meant that even the greatest mortality reduction inside CCU, would at most reduce societal mortality with about five percent, where Meltzer and Kitchell in 1966 had speculated about 10 percent.\(^3\) In writing down this percentage, Goldman showed himself more optimistic than Aubrey Colling and his colleagues had been in 1976, the scientists who were responsible for the Teeside coronary study. They saw no effect whatsoever of CCU-care on societal mortality.\(^4\) And one year before Colling had already called a

\(^{2}\) Also: Goldman, ‘The CCU and Coronary Artery Disease Mortality’, 86
\(^{3}\) Meltzer, Kitchell, ‘The current status’, 5
five percent reduction an ‘estimate of maximum benefit’.\(^1\) Goldman concluded:

Thus the monitoring and nursing facilities of CCUs may reduce in-hospital sudden deaths, but at present there are no data to suggest that the many subsequent innovations have substantially contributed to the decline in United States mortality rates even though they may occasionally and dramatically save individual patients.\(^2\)

Although with this Goldman touched upon a factor not to be neglected in explaining the rise of the coronary care units - dramatically, right in front of your eyes saving the life of individuals, be it often for only a short time -, this did not explain away the fact that CCUs had provided certainly no overall, but at most a small partial explanation for the decline in mortality caused by acute myocardial infarction since the end of the sixties.\(^3\)

One year later Goldman further developed this in an article in *Primary Cardiology*. On the ground of mortality research as well as on historical grounds - the constant change in CCU-goals - much of the presented mortality reduction data were arguable. He estimated that from

\(^1\) Rose, ‘The contribution’, 147-148
\(^3\) See f.i. as well: Richard Cooper et al., ‘The Decline in Mortality from Coronary Heart disease’, in: *Journal of Chronic Diseases*, 31 (1978), 709-720, es: 719. Cooper pointed at all kinds of things causing the lowering of the mortality rate, but CCU was not amongst them.
about 500,000 hospital admittances caused by myocardial infarction, CCU had only saved a 10,000 lives extra. This number could be enlarged with another 2000 if every hospital would use lidocaine responsibly. An efficiency of a bit more than two percent and so indeed anything but the explanation for the great mortality reduction seen at the end of the sixties, and certainly not the explanation of the ongoing reduction in the early seventies. In fact the preventive treatment initiated by Lown had been the last form of CCU-therapy that had really done some life saving work, in spite of all the expensive improvements executed in the CCUs since then.¹

These data should not, however, be interpreted to mean that the costly interventions introduced since 1973 have not saved the lives of many individual patients. Nor is this an argument that such interventions should be abandoned. Nevertheless, it is imperative that one recognizes the relative impact of various interventions, especially the minimal incremental impact of the recent costly interventions in coronary intensive care.²

A previous stage of his research had led Goldman tot the conclusion that in countries like Great-Britain, Mather’s and Hill’s fatherland, after a 24 hour-survival CCU-care would no longer be necessary. For these first 24 hours however, intensive coronary care remained advisable. In

¹ Goldman, ‘The CCU and Coronary Artery Disease Mortality, 84, 87, 91, 92, 94
² O.c., 94
the US, where culture was much more directed towards hospital care, and where because of that Mather’s and Hill’s recommendations were not viable, CCU-care could be limited to three days. Patients who had suffered an uncomplicated attack, reaching hospital only after 24 hours or more, would not even have to be admitted to CCU at all. The risk was tiny and costs were much lower. It was an opinion, translated economically, Goldman shared with Peterson. He wrote in 1978 that a cost-effectiveness report for Great-Britain probably would recommend home care, but for the US hospital admittance combined with minimal intensive care.

CCU-care versus homecare and hospital care

The researches of Mather and Hill has already been mentioned several times earlier. It was one of those British inquiries leading to Juian’s remark: ‘If the British were rather slow in implementing coronary care, they were not backward in questioning its value.’ Julian was critical on the scientific value of the several home-versus hospital researches agreeing with Oliver who in 1967 had stated that it would be almost impossible to carry out valid randomised trials of CCU’s. Nevertheless:

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2 Peterson, ‘Myocardial Infarction’, 260
3 Julian, ‘History of the CCU’, 500
Despite their defects, these studies did serve a very important func-
tion in drawing attention to the fact that intensive care can have no
significant impact on mortality in low risk groups.¹

Mather and Hill’s researches concerned a comparison between mor-
tality at CCU and at home (both), or between CCU mortality and nor-
mal hospital ward mortality (Hill). Mather’s conclusion from an in the
medical world highly criticized² as well as cheered³ inquiry, was that
there was no sign whatsoever of a positive difference in mortality in
intensive care when compared with home care.⁴ Repetition of his re-
search four years later even gave a slightly negative result for CCU-
care.⁵ This conclusion was confirmed by Hill who in 1978 published the
data from a randomised trial into ‘home versus hospital-treatment’, es-
pecially set up to counter the critique on Mather’s methodology.⁶ It
brought Taylor to observe that it obviously had not been Mather’s
methodology that caused the critique, but the outcome. ‘If the results
had vindicated coronary care units the boom of voices extolling the vir-
tues of the trial’s design would have been heard halfway around the

¹ o.c., 500-501 (quote: 501)
² F.i.: Meltzer, Kitchell, ‘The development’, 18; ‘The Care of the Patient’, 25;
Fleischmann, ‘The Evolution’, 4
³ F.i.: Editorial, ‘Myocardial Infarction Then and Now’, in: Lancet, 9-3-1974,
395-396, 396; Waitzkin, ‘A Marxian interpretation’, 1262
⁴ Hofvendahl, ‘Influence of treatment’, 73
⁵ Mather, ‘Acute Myocardial Infarction’, 334; Mather, ‘Myocardial Infar-
ation’, 925
⁶ J.D. Hill, ‘A Randomised Trial of Home-Versus-Hospital Management for
Patients with Suspected Myocardial Infarction’, in: Lancet, 22-4-1978, 837-
841
world.’¹ Be this as it may, this of course does not proof that the remarks on Mather’s methodology in itself were false - even if the ‘errors’ were unavoidable. Nevertheless it remains striking that research leading to CCU-negative conclusions, were much harder criticized than research with a positive outcome for intensive care, although from a scientific point of view these last ones often were at least as questionable, or even more so. So it is not surprising that Lie would conclude that the critics just were not interested in (the outcome of) the discussion on ‘home versus CCU’, like on the whole the Illich-discussion was completely thrown away on cardiologists and internists who believed technology was the way to medical heaven. It simply was not in their interest. The conclusions drawn were unwelcome, hence the scientific character and methodology were challenged. Partly this critique was certainly justified, but it would have been even more justified in research that was nevertheless embraced, because the outcome was cheered.²

Referring to similar criticisms on Hill’s latter research, Peterson no longer made a secret of his astonishment:

Are poorly controlled clinical studies to be as influential as clinical experiments in determining what services are provided? Are decisions to be shaped by opinion rather than a systematic approach such as cost-benefit calculation? The questions raised by the paper

¹ Taylor, Medicine out of control, 113
² Interview K.I. Lie, Amsterdam, 8-6-2000
of Hill [...] are not only about clinical efficacy and cost but about the scientific basis for medicine.¹

Like Mather had not been the first to point out that patients with a heart infarct could just as well be treated at home - in 1964 a certain H.J. Wright had already said the same, although in an unpublished piece, followed by a hardly noticed inquiry of Sleet in 1968 and a 1969 Oxford PhD of L.J. Kinlen -² Hill had not been the first to compare CCU and hospital ward. In 1965 Killipp and Kimball had done the same, although not randomised. Two groups were compared, each one hundred persons strong, all suffering from a diagnosed myocardial infarction. The first criterion for selection was the availability of a bed, but when admittance happened simultaneously, choice was up to the doctor. Naturally because of that still some differences between the groups occurred. Thereupon Killipp and Kimball, by the way without shocking their confidence in the CCU-concept, came up with a, certainly for that time, remarkable conclusion. Mortality in the unit had been higher than in normal hospital ward (32 versus 29 percent). However, they remarked that about ten percent of the death of CCU-patients occurred after having left the unit, that one of the differences between the two groups was that the average age of the CCU-group had been two years higher (65 to 63 years) and that on top of this, as a consequence of the medical choices the doctors made, the CCU-patients had been ill more

¹ Peterson, ‘Myocardial Infarction’, 260-261; Taylor, Medicine out of control, 118
² Mather, ‘Myocardial Infarction’, 925; Fracheboud, ‘Hartinfarct’, 17
severe than the group in regular hospital ward. The emphasis on these points is, of course, far from surprising. What is surprising, however, is that in inquiries showing CCU-advantage, questions on the validity of the comparison (CCU versus ward of ‘before versus after’) were only seldom raised. Furthermore, Killipp en Kimball remarked that precisely because of the presence of a CCU, care for heart and coronary patients in the entire hospital improved, so that patients not admitted into CCU also benefited from it.¹

This however contrasts fiercely with the opinion of those critics pointing out that because of the presence of a CCU also less severe cases of coronary patients were admitted into it, patients actually not in need of special intensive care. On the one hand this happened so all patients could benefit from that special care, but on the other hand probably also to raise CCU-effectiveness data. However, because of this the severity of illness in the ward rose and therefore also average mortality. So all these nuances could not take away the simple fact that the comparison itself had been disadvantageous for intensive coronary care.

However, five years later, as said, Christensen as well as Hofvendahl came up with a totally different outcome. Among patients suffering from myocardial infarction, Christensen measured a difference in

mortality of almost 25 percent in CCU-advantage (17.6 in the unit against 41.4 in the ward),\textsuperscript{1} and Hofvendahl saw a comparable difference of about 20 percent (17 against 35). It was remarkable however that this difference was almost entirely reached at the fist day after the infarct. The longer the care lasted, the smaller the difference between CCU- and hospital ward-mortality became. In other words: in the CCU-group there was a high ‘after-care mortality’. This, however, did not persevere on the even longer term. Seen in a time span of several years, in both groups death after dismissal was all but equal. Nevertheless, according to Hofvendahl, all this taken together most certainly a decline in myocardial infarction mortality in hospital as a whole appeared as a consequence of CCU-installation.\textsuperscript{2}

But six years later Hill could not back up these findings. As Christensen and Hofvendahl had done, he had taken bed-availability as starting-point. So strictly spoken his inquiry too was not a randomised trial, but nevertheless resulted in more or less comparable groups. Contrary to the Scandinavian researchers, he only found statistically negligible differences. Below the age of 65 CCU-mortality was 15 percent against 18 in the ward and above 65 the numbers were respectively 31 and 32.\textsuperscript{3}

A second remarkable difference between the Scandinavian inquiries on the one side and the British on the other, involves the (contradicting)

\begin{itemize}
\item \textsuperscript{1} Ib. Christensen et al., ‘Benefits Obtained by the Introduction of a Coronary-Care Unit’, in: \textit{Acta Medica Scandinavica}, 189 (1971), 285-291, 285, 290
\item \textsuperscript{2} Hofvendahl, ‘Influence of treatment’, 73, 74
\item \textsuperscript{3} Hill, ‘Comparison’, 81, 83
\end{itemize}
psychological impression a CCU could have on patients. According to Hofvendahl the omnipresence of all the technological equipment had a soothing effect on patients. It gave them a sense of security and on the whole it made them believe in a happy end. Being transported from CCU to hospital ward therefore often lead to an increase in anxiety and panic, while from a strictly medical point of view there was no reason for it at all. In other words: patients developed a psychological dependency on CCU.¹

In 1975 Rose came up with an entirely different conclusion. That, he said, there was no noticeable effect of CCU-care on death in society as a whole, could of course be explained away by arguing that the effect occurred, was lost in the total picture. But one had to ask oneself as well whether admittance in the unit ‘causes these very rhythm disturbances which it is now so successful in controlling’. Or: without CCU-admittance maybe many saved by the unit’s defibrillator would not even have been in need of one, and therefore are falsely put on the CCU- or hospital-list of lives saved.²

In 1976 Mather agreed. Although, he wrote, in several inquiries a positive psychological reaction of CCU-care was assumed, his experience was a different one. The stress of transport to and admittance in a CCU could contribute to a raise in fear already existing, and because of that have a negative impact on the health condition. In the case

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¹ Hofvendahl, ‘Influence of treatment’, 70
of homecare this effect would stay aside.\textsuperscript{1} By stating this Mather again ran counter to the recommendations of the Joint Working Party one year earlier. Amongst other things it had said that no proof for an alarming effect of transport by a MCCU to hospital was available.\textsuperscript{2}

Technology-critics like the already mentioned Taylor chose to ignore remarks like this. To them the truth of the theory was evident. It not even was a theory. That MCCU as well as CCU were doing more harm than good was all but a fact, with this showing that not just CCU-protagonists altered acceptations into data and data into facts. Pointing amongst others at Mather and Rose, Taylor asked himself quite desperately ‘what sort of evidence is required before the dismantling of the coronary care empire can begin’.\textsuperscript{3} So probably Taylor will have been astonished that the first scientific study into an alarming effect of CCU-care did not at all point in the direction he would have expected. A research in the Amsterdam Binnengasthuis (Central Hospital) gave no evidence whatsoever for the proposition that patients suffering from a heart attack would benefit from home care, for so they would not suffer the possible stress of transport and CCU-admittance. Increase of stress was a consequence of complications inside CCU sooner as it was its cause. ‘Coronary scare’ hardly played a role. In other words, of course the effect of rhythm disturbances caused by (transport into) CCU would

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\textsuperscript{1} Mather, ‘Myocardial Infarction’, 928
\textsuperscript{2} ‘Care of the Patient’, 40
\textsuperscript{3} Taylor, \textit{Medicine out of control}, 110, 115, 116 (quotation: 116)
appear every once in a while, but was no reason to abandon admittance plans.¹

The question of course remains how to explain the differences between Hofvendahl/Christensen and Mather/Hill. Without pretending to give a complete answer, one can point at the fact that the difference in opinion on heart and coronary care in Great-Britain on the one hand and the European mainland and especially the US on the other - imbedded in different opinions on care and hospital- or home nursing - were strictly tied to the way one looked upon technology in general. Much more than in Great Britain, in the rest of the Western world technology was looked upon as inherently ‘good’. Technology not only caused improvement, technology was improvement. In this vision problems resulting from the use of technology were not countered by criticizing existing technology, but by asking for more and new technology, by asking for further development of it.² If the introduction of new technology caused problems, this did not prove that the technology was no good, but merely that it was not yet good enough.

This had its consequences for the way one judged intensive coronary care and therefore for the (interpretation of) CCU-research data. This would partly explain why Mather’s and Hill’s data diverged from many other inquiries, although, as briefly said, many British hospitals moreover were not suited - too old, too poor - for installing a CCU, or, when it was installed, for it to reach its maximum effect. Nevertheless,

¹ J. van der Lelie, A.J. Dunning et al., ‘Is the Coronary Care Unit a Coronary Scare Unit?’, in: Acta Medica Scandinavica, 210 (1981), 497-500
² See e.g.: Meltzer, Kitchell, ‘The development’, 18 (note)
and in spite of all the criticisms of their methodology, Mather and Hill were amongst the ones causing a more shaded view on CCU in medics all over the world. ‘Amongst the ones’, because, as stated, a few years before Mather’s research the CCU-image had begun to show some tiny cracks. Within a few years these cracks would grow into fierce cleavages, caused by the technology-critique of Ivan Illich and his followers. They would not seldom point at Mather and Hill to endorse their criticisms and, as said, as perfect images of CCU–protagonists on their turn would leave aside the researches giving a more CCU-positive outcome.
5 Societal critique on the CCU-concept

Critique on technology-fascination

Illich and his supporters were not the first to make a butt of the (uncritical attitude against) medical technology in general or CCUs in particular. In 1964 already, when the first CCUs were just taken into usage, Robert M. Farrier, assistant director Clinical Center National Institutes of Health, spoke his mind not entirely without cynicism and humour.

From the reading of current popular literature, it appears that anyone who has ever had the slightest indication of cardiovascular disease will, in the future, wear a miniaturized or even subminiaturized electrocardiographic transmitter which sends an alarm to his physician - presumably when the physician is on the golf course - whenever anything happens to the patient’s heart, whether it be the first stages of a myocardial infarction or simply a tachycardia due to passing a lovely blonde.¹

Monitoring patients, or in a broader sense, medical electro technology, was ‘hot’ and the American audience gazed at it with admiration. Not that Farrier opposed technology. That was, so he said, in fact impossible because it would be the same as for a member of Congress declaring opposition against God, country and motherhood. A proper and careful

use of technology surely would bring medicine a lot of advancement in its everlasting battle against sickness and death. ‘I do feel, however, that the cosmic approach to patient monitoring should be dropped, so as to consider what patient monitoring really means from a practical standpoint.’\textsuperscript{1} Without doubt the technological gadgets the hospitals were equipped with would work, but only if the circumstances were right and the gained data readable and interpretive.

All of the information that we as physicians receive from these monitors may very well not be of immediate application in the care of a specific patient insofar as can be seen at this date, but to remind you of the famous man’s old cliché ‘of what use is a newborn baby’. I am in no position to state now the total use of this newborn baby in the future. At the present it is of limited use. This use may, in the future, be demonstrated to be far greater than we suspected, and there may be uses which are not immediately applicable to patient care but which may be very significant in understanding of the total picture of disease.\textsuperscript{2}

In the beginning of his article he used the word ‘gadgets’ a bit teasingly, but at the end he got serious. The monitoring equipment he had seen in several hospitals was often unnecessary, often much too complicated, and certainly much too expensive. Nevertheless, he never had the feel-

\textsuperscript{1} Idem
\textsuperscript{2} Idem.
ing that they were bought with other than strictly medical intentions, and for other than strictly medical goals. ‘Recently, however, I have had brought to my office some things that begin to frighten me.’ Farrier thereupon told the story of the cooperation of a highly valued medical department-store within an similarly valued technological corporation, which tried to sell superfluous and malfunctioning but extremely expensive blood pressure meters to doctors. They should be incorporated into intensive care units. He therefore impressed upon his audience to be careful with any purchase.

I do not believe that major financial commitments are justified at this time to patient monitoring systems, except within very limited areas. I do not foresee in the distant future total patient monitoring which would appear to be what some writers in this field are prophesying. I do strongly believe, however, that patient monitoring devices will be common in the next few years. They will be accurate and they, in general, will not be very useful; but in some areas they will be critical. They are not going to be used to save nursing time or even save money, but will be used to save lives. [...] I, therefore, close with the admonition that you should know exactly what you intend to do with monitoring systems before you buy them but that you do definitely plan on their utilization within limited areas in the future.¹

¹ O.c., 398-399
Selzer joined ranks with Farrier and pointed directly at the CCU. Although the educational aspect of the unit could not be denied, and although the higher nursing responsibility was a nice matter of secondary importance, presenting it merely as a medical answer to a medical question was just plainly wrong. Technological gadgets fascinate and CCU equipment was not much less than a symbol of status. Every hospital took pride in its unit, and wanted to show it off. So, Selzer said, ‘it is important to appreciate that hardware by itself is useless and to avoid falling into the trap of believing that monitoring alone is doing the job for the patients’. Selzer by the way had received the comment from a colleague that it was hardly imaginable for him to oppose CCU. One could compare this with - compare Farrier’s remark four years earlier - opposing motherhood. Selzer answered that he, of course, did not really oppose CCU, as he did not really oppose motherhood, but, like he did raise questions regarding motherhood because of the explosion in population, he could raise questions regarding CCU.

Selzers remarks were in line with those A.C. Gelijns in 1991 would make in her *Innovations in Clinical Practice*. In the medical world, new technology as well had an attractive power far beyond rationality. Furthermore new technology could be purchased for reasons besides direct use, such as competition with other hospitals or common prestige. This,

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1 ‘Controversies’, 602
2 O.c., 599
for instance, manifested itself in a better possibility to attract better educated personnel and/or bigger research grants.¹

In the history of cardiac arrest, Selzer held before his audience, there were examples of overenthusiastic response to new forms of treatment more often, such as administering new kinds of medication or blood diluters. Not once, however, could the enthusiasm, or better: the result enthusiasts claimed, really be proven. In his conclusion, Selzer therefore once more repeated that he did not really oppose the units, but certainly was in favour of reducing the enthusiasm to normal, critical consideration, so in fact reducing it to the way in which every new drug or technology should be encountered. The intensive coronary unit was a suchlike new technology, and like every other new technology it sometimes would, and other times would not lead to the outcome wished, thought or hoped for. The enthusiasm was misplaced firstly because all the statistics used thus far were unreliable and secondly because for instance doctors claimed that every succeeded resuscitation, monitors had deemed necessary, had indeed saved a life. Selzer doubted this claim,² but, as seen, opinions on this differed strongly.³

The overenthusiastic response was also broached by Secher in his book Patient Monitoring, published in 1970. Almost everything could be monitored - ‘if we pay for it, of course’ - but this was not to say it always had some use. In many cases the results of simpler means of re-

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¹ Anne Christine Gelijns, Innovation in Clinical Practice. The Dynamics of Medical Technology Development, Washington 1991, 33
² O.c., 600, 601
³ Interview E. Dekker, 10-8-2000
search or treatment were just as satisfactory. But: ‘monitors do look sophisticated!’ As a consequence often, at least in the hospital Secher worked at, the Righospitalet in Copenhagen, it was often easier to buy an expensive and impressive apparatus, instead of a cheap and ugly one, although the latter was as good as the former, considering the goal it had to serve. Furthermore, monitors not only were expensive, but also still without any form of standardization. Because of this, it was very difficult to use different brands at the same time, although one brand had a better apparatus for this goal and another for that.¹

With his resuscitation example, Selzer already pointed at a danger directly connected with the over enthusiasm: the danger of being over treated. Arrhythmia appeared in about half of all patients suffering from myocardial infarction. According to Selzer, in the past many had survived with only minimal treatment or even without treatment at all. Now aggressive treatment was recommended, a therapy indeed very successful in Lown’s unit - as said Selzer’s opponent in the discussion. But this anything but implied that it would be the case in less equipped units manned with less experienced personnel as well.² It was a hazard in 1969 R.M. Norris et al. emphatically drawn into their exposition on the new coronary prognostic index (CPI), based on six factors like age and severity and place of the infarct, in which they reasoned that only patients suffering from an average attack would profit from CCU-treatment. People suffering from mild attacks did not need such inten-

¹ Secher, ‘The use of monitors’, 5, 6
² ‘Controversies’, 601
sive care and those suffering from severe attacks would die anyhow, CCU or no CCU. The only difference with Secher and Selzer was, that they pictured this hazard as an inevitability. According to them, CCU indeed had a declining effect on mortality brought on by prevention of ventricle fibrillation. However this effect appeared especially in only ‘moderately severely affected patients’. But as it was all but impossible to select this group previous to CCU-admittance, they kept pleading for admittance into CCU of all myocardial patients, so in spite of the fact certainly a large part of them would hardly benefit from it or not even at all.

About five years later Martin, and in his footsteps Bloom and Peterson, would return to this subject. Martin discovered that often the severity of the attack had no influence whatsoever on the measure and nature of treatment. This brought Peterson, who had made the costs of the unit his main point of criticism, to comment that ‘we are left with the uncomfortable possibility that increased expenditure has purchased useless service’. Together with Bloom in 1973 he reasoned that an anything but small number of patients treated in CCUs, could just as well, and against costs far less, be treated in normal ward. And six years before this Julian, Oliver and Donald already published on the dangers of

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4 Bloom, Peterson, ‘End results’, 76-77
(the abundant use) of pacemakers and medication against fibrillation. Of course, they helped against the diseases they were meant for, but they also caused new evils. Used in hospitals not fit for their usage, they maybe even caused more lives lost than saved, exactly the outcome of the randomised lidocaine-research of Lie some years later.

The question of the importance of well instructed and experienced personnel brought Selzer to wonder whether the world was ready for CCU-care. Although the technology was present, that was not to say there also was abundant personnel to make this technology profitable in a vast number of hospitals. According to him, it would take quite a while before this would be the case. In the meantime the units, because of the side effects, might well do more harm than good.

He stood anything but alone in this opinion. Julian, Oliver and Donald as well concluded that however much the introduction of CCU had been medically justified, uncontrolled growth of the number of units would lead to scarcity of medical as well as nursing personnel on other medical fields. Saving the life of a cardiac or coronary patient could thus lead to the death of a patient suffering from another disease. Because of this effect, the growth of the number of CCUs had to be put to an end. The existing CCUs had to focus on a combination of care, education and research. On top of this new units should only be opened in hospitals that could ensure growth and blossom of all three points, and even then preferably if they could be incorporated in a general in-

\[1\] Oliver, Julian, Donald, ‘Problems’, 469, 471
\[2\] ‘Controversies’, 601
tensive care department. CCUs in the beginning were set up in leading hospitals, backed up by liberal financial means, run by top of the bill cardiologists. All in all it was not very likely that units in lesser equipped hospitals serving a more common goal, not even class I or II units, let alone class III or IV, would have the same results as in hospitals like Lowns.¹

In 1967 D.M. Lawrie as well endorsed this view. The ‘English problem’ was not at all an English problem. As a cause of construction failures, shortages in equipment and scarcity of personnel most hospitals in other countries were not fit and could not be fit to let their units function in the most optimal way.² Continuous monitoring and high-quality care therefore could merely be reserved for a small part of cardiac patients. This again caused CCU to have only a small effect on community myocardial death.³ To this Selzer added, that in technologically poorly equipped units, staffed by inexperienced personnel, very likely resuscitation could be the consequence of misinterpretation of the often enormous and certainly for inexperienced nurses too vast amount of data gained.⁴ This as well would hardly serve patient’s health. Referring to this, and following Oliver, Selzer too pointed at the false feeling of security especially in so called class III and IV units, units completely focusing on combating arrhythmia, although this was only one of the many problems.

¹ Oliver, Julian, Donald, ‘Problems’, 471; Oliver, ‘The place’, 50
³ Oliver, ‘The place’, 50
⁴ Secher, The use of monitors, 6
problems occurring amongst myocardial infarction patients.\textsuperscript{1} About a decade later and in line with the cost reduction discussion, Bloom and Peterson added that only about half of the number of CCU-patients actually had a heart attack. ‘Simply stated, too many facilities have been provided’,\textsuperscript{2} a critique Enthoven later on would endorse. In his \textit{Health Plan}, he denounced attitude, often established amongst medics, that a lot of treatment is always preferable over little or no treatment.\textsuperscript{3}

\textbf{CCU as the symbol of the condemnable medical model}

In 1974, on the ground of all the arguments raised against CCU concerning costs that were too high, insecurity of effectiveness and the danger of over treatment, Lindholm and Astvad had concluded that amidst all the fuss, everybody should agree on at least one point:

\begin{quote}
It would have been less costly and far more informative to have set up initially a limited number of well-staffed and well-equipped CCUs to study the effectiveness and value of these units before investing on a large scale in CCUs around the world.\textsuperscript{4}
\end{quote}

It is very doubtful if indeed everybody agreed, but six years later Enthoven had no problems with this. ‘In any case’, he wrote, ‘innovations in medical technology should be thoroughly evaluated early, before

\begin{itemize}
\item \textsuperscript{1} Controversies, 601
\item \textsuperscript{2} Bloom, Peterson, ‘End results’, 72, 76
\item \textsuperscript{3} Enthoven, \textit{Health Plan}, 6
\item \textsuperscript{4} Lindholm, Astvad, ‘Coronary Care Units’, 673
\end{itemize}
being put into widespread use, especially if they involve large sums of money’. Although in the case of pharmaceutics this had been practice for decades already, this was not the case with new technology,\(^1\) as Karliner noticed as well. However, when Lindholm and Astvad made their remarks which went even further, principal instead of merely practical criticism, had already raised its head. It was a kind of criticism reaching its high in the days of Enthoven’s publication, renouncing suchlike criticism as merely treatment of symptoms. Setting up a few CCUs and waiting for results before proliferating the concept all over the world, went against the concept’s nature, or better: went against the nature of the system in which the units blossomed. It was a kind of criticism Secher - probably without being aware of it - in 1970 already had given a foretaste of. Some doctors, he remarked, had more faith in machines than in their own medical skills. Others pointed out that because of the machines, the number of staff could be reduced. ‘But we find that our nurses have attributes over and above those exhibited by tubes and transistors.’\(^2\)

The principal critique can be split into two, partly overlapping parts. On the one hand the medical model was aimed at, a model neglecting to look upon the human body as a whole; a model in which the relationship between body and mind had gone astray and in which not the community as a whole, but the individual had become the criterion for defining ‘health’. And on the other hand there was the Marxist cri-

\(^{1}\) Enthoven, *Health Plan*, 51-52 (quotation: 52)

tique, in which especially the medical market was taken a shot at. Both forms of criticism saw CCU as a typical example of the system to be combated.

In 1975, Ivan Illich’s book *Medical Nemesis* - *The Expropriation of Health*, was published, refreshed in 1976 under the title *Limits to Medicine*. Illich severely criticized the mechanical, intramural healthcare which was obsessed with treatment. Man, so he said, was made ill instead of kept healthy. Slowly but definitely medical apparatus had become more of a threat to health than a warrior against sickness. Curing disease had become more important than prevention, and medical competence outweighed taking care of living conditions. The individual was divided into an almost countless number of different particles and had fallen victim to far-reaching medicalization. Western, technological medicine was expensive medicine, especially taking care of a limited number of well off patients, who by the way had to thank their own unhealthy life-style, directed at consumption and welfare, for the diseases treated. This at the expenditure of the ‘right to health’, the right of the poor - in the West itself, but mainly in the Third World - to have as much access as possible to healthy living conditions. Fundamental basics such as water, food and spiritual development were withheld from them. In other words: a lot of money was spent on numbers of - often useless - attempts healing the happy few, while prevention of sickness for complete communities was neglected or even completely forgotten. If spent on water, housing and sexual education in Africa, the money paid for CCUs could save a lot more lives. Instead, in the ‘underdevel-
oped’ countries as well, the Western medical model was seen as the only real answer to all health problems. This caused not only the disappearance of ancient rituals in coping with suffering and death, but also the setting up of expensive, well equipped hospitals that were far off, at the expense of primary healthcare in the vicinity.

The pharmaceutical industry, according to Illich, had a sickening effect. In cooperation with medical establishment, it only tried to talk mankind into taking ever more and constantly new kinds of pills. And the technological industry, again in cooperation with magisterial doctors, pictured an ever more advanced technology, as the answer to all our ailments. Except the wallet of industrials and doctors, the only thing really flourishing was iatrogenesis, sickness caused by treatment - clinically, socially as well as structurally. But, one said, one at least had to do something, even it was useless. The notion that it could be sometimes better just to do nothing, was completely forgotten, or even seen as highly unethical.

As final frontier now even death was declared war upon. Not combating and lingering suffering, but postponing death had become the hallmark of medicine and the cardiologist sitting in his intensive care unit for heart and coronary patients was its emperor. That results up until then were anything but impressive did not matter. Some more technology would do the trick. This even altered the definition of death. Man no longer blew his last breath of life. Man no longer had deceased when his heart had stopped beating. Man was declared dead the moment the electro-encephalogram registered a flat line of brainwaves,
and even then the heart was still kept beating. No wonder in Illich’ eyes the units for intensive care, and most of all for intensive heart monitoring, were grotesque. In his view, as every other industry, the multinational called healthcare tried to sell its products where demand was all but unlimited: holding off death. An increasing amount of tax money was spent on life prolonging technology. Regular dialysis was the fate of many threatened by kidney insufficiency. According to Illich the chosen patient was conditioned ‘to desire the scarce privilege of dying in exquisite torture’. As proof he quoted the sickness memoirs of a doctor, C.H. Calland. He remarked that in the first, and sometimes even in the second year the artificial kidney was busy expanding his lifespan, much time and effort was wasted in keeping him from committing suicide. ‘In a society’, Illich wrote, ‘where the majority die under the control of public authority, the solemnities formerly surrounding legalized homicide or execution adorn the terminal ward. The sumptuous treatment of the comatose takes the place of the doomed man’s breakfast in other cultures.’

Illich completely understood why all modern technology tied to patients during their last hours or days flabbergasted a lot of people, for longing for miraculous recovery characterizes almost every human being. Intensive care therefore was nothing less than the acme of public admiration, ‘organized around a medical priesthood struggling against death’. Coronary care, the show-pupil amongst intensive care, de-

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1 Ivan Illich, *Limits to medicine. Medical nemesis: the expropriation of health*, London 1977 (2), 105-106
manded three times the equipment and five times the amount of personnel needed for normal patient care. Because of this, of all qualified hospital nurses in the United States over ten percent was active in this heroic form of medicine. So the success of what Illich too considered to be a coronary scare unit, on the one hand was completely clear to him, on the other side however a complete riddle, adding again that he too interpreted and shifted CCU-data somewhat one-sided.

This gaudy enterprise is supported, like a liturgy of old, by the extortion of taxes, by scale random samples have been used to compare the mortality and recovery rates of patients served by these units with those of patients given home treatment. So far they have demonstrated no advantage. The patients who have suffered cardiac infarction themselves tend to express a preference for home care; they are frightened by the hospital, and in a crisis would rather be close to people they know. Careful statistical findings have confirmed their intuition: the higher mortality of those benefited by mechanical care in the hospital is usually ascribed to fright.¹

In 1979, with his *Medicine out of Control*, Taylor joined hands with Illich. According to Taylor, who would go into the CCU-example more explicitly and thoroughly, the fixation of modern society on the individual, and especially the ‘good role’ technology played in this, had led to a blind spot regarding the consequences for the entire population. It re-

¹ O.c., 106-107
sulted in the assumption that more technology equalled more progress and that every new problem - although perhaps caused by the ‘solution’ of the former - could be overcome by even more and even more advanced machinery. This conundrum, mentioned a few times already, played a role as well - or better: even more - in medicine, that branch of science and society seen as the ultimate example of how technology could serve mankind, even by groups and individuals taking a more critical stand where other parts of society were concerned.¹

The problem was not technology itself, but the fact that it was seen as an inherently good, instead of as a neutral artefact, an artefact that, also in medicine, could be used for the better as well as for the worse. Because of this, serious evaluation of the effects of technology in medicine was hardly ever undertaken and in fact not deemed necessary. Furthermore technology was used in all kinds of fields where it was hardly needed, making healthcare unnecessarily expensive. Money was spent that, set in elsewhere, could have been of far more use. Technology in other words simply was not used sensibly and carefully. Looking at medicine, Taylor even spoke of ‘science fiction’-healthcare, considering ‘the preoccupation of medicine with its newly acquired gadgetry and flashy technology in the face of meagre evidence as to the usefulness of many of these new methods in diagnosis and treatment’.

This appellation is particularly apt for a supposedly scientific discipline which pays more attention to promoting its technology than

¹ Taylor, Medicine out of control, 1
evaluating it, and spends more time stridently announcing victories than in carefully analyzing failures.\footnote{O.c., 3}

This was even more surprising because a fine methodology to study outcomes was known: the randomised trial with control groups. But on the basis of retrospective comparisons which in hindsight turned out to be false, new treatments were introduced before trustworthy data were gathered out of reliable research. Or, before actually a well-considered decision could be made, a fait accompli had already been reached. Taylor:

Clinical actions are becoming as much determined by the \textit{existence} of sophisticated gadgetry, as by any rational assessment of what more can be achieved by using these methods.\footnote{O.c., 5}

Taylor pointed out that since the beginning of the twentieth century adult death, especially male, had not been brought back appreciably. Merely the cause had changed. Infection diseases had been replaced by ‘degenerative’ welfare ailments like heart- and coronary disease. And this in spite of the growth of technological knowledge and the invention of all kinds of ingenious medical-technological apparatus. Often the influence of new gadgets was highly overestimated, examples being specific antibiotics and radioscopic campaigns. Undoubtedly they con-
tributed to reducing death by tuberculosis, but they did not cause the decline itself. That already set in strongly before their introduction. Nevertheless, the overestimation made that in countries where tuberculosis was not yet wiped out, the hygienic and health measures that in Western countries had set in the decline - improving social and economical living conditions - were not taken, but preventive vaccination and medical cure were relied upon.¹

Heart- and coronary diseases had taken the place of the tuberculosis bacillus. A phenomenon that was very rare at the beginning of the century had in merely fifty years grown out to be the major cause of death in the Western world. The medical world had launched an extremely expensive, technological attack on this new epidemic, but it was very doubtful whether this attack would have the slightest influence on mortality, an assumption according to Taylor ‘even’ admitted by experts. For instance, at a conference on the prevention of coronary heart disease a member of the Joined Working Party had remarked: ‘We consider the present size of the coronary heart disease problem in this country and the small effect of medical and surgical treatment on the mortality rate from coronary heart disease justifies the attempt to prevent a disease we cannot cure.’² The italics show that this remark not only had Taylor’s interest because of the doubt it raised with regard to the effect of medical treatment and the influence of medical intervention. In fact the re-

¹ O.c., 7-8, 10, 15-18
² O.c., 21
mark also meant that if medical intervention was successful, prevention was no longer deemed necessary, and even unjustified.

But even if medical-technological interventions were successful at all times, in the eyes of Taylor this still was no justification for continuing. However, also in medicine far too often the possible equalled the necessary or the desirable. And this only ‘because of the inability of the primary species on this planet to make decisions to control its own technology’. All the time and on every possible field the medical world, according to Taylor, evaded crucial decisions that had to be taken concerning diagnostic and therapeutic problems, exactly as a consequence of constantly taking new technology in operation. Technology only was seen as the solution for, and not as the cause of, problems, that it is as well.

[The medical establishment] has sat back, drifted along, and allowed technology to dictate diagnostic techniques and treatment regimes without subjecting these new methods to proper assessment. Most of these new technological ‘advances’ have been uncritically accepted as efficient and superior to previous used methods and have not even been subjected to proper scientific medical scrutiny let alone to psychological, social or economic analysis. The medical establishment has not risen to the challenge to control its space age armory: the technology is out of control.\(^1\)

\(^1\) O.c., 106
A classical example was the intensive coronary care unit. The intellectual faculties of the medical world failed, resulting in an unhampered march of technology. Taylor, too, pointed out that the units looked quite impressive and therefore actually no one was to blame for the fact that the sheer existence of these costly and advanced units was pictured as a distinctive success in combating death from heart- and coronary disease. Nevertheless, this was anything but the case. Taylor too could not help pointing out that influence of CCU on total myocardial death was marginal at most, in spite of the triumph giving them a respected place in American and European hospitals, and in which patients were treated of whom about half was not even in need of intensive care. Sadly enough the setting up of CCU’s - in itself, Taylor wrote, an experiment to be applauded - was not followed by thorough inquiry into effectiveness and efficiency as Lindholm and Astvad propagated, but rather by unscientific hagiographies presenting highly unlikely results. The consequence was that, because of the common spread and acceptance of CCU’s in the meantime, it was almost considered ill practice to set up research programs worthy of the label ‘scientific’, on top of that research of which the outcome often was neglected. Taylor quoted a 1969 regional inquiry concluding that the existing CCU-capacity was sufficient to provide in all possible needs, incorporating even thirty percent of the cases in which infarction was only suspected and not diagnosed. Nevertheless in the next two years, CCU-capacity in this region was enlarged with another seven percent. Taylor: ‘This un-
derlines the inability or unwillingness of the medical establishment to control unnecessary expansion.’

**CCU and capitalism**

In 1979, with his article ‘A Marxian Interpretation of the Growth and Development of Coronary Care Technology’, Howard Waitzkin added anti-capitalism to the technology-critique that until then was mainly based on a rejection of the medical model and an embrace of concepts as International Health Care and Right to Health. Certainly, Waitzkin’s article off and on is a highly propagandistic, ideological piece. It for instance closes by stating: ‘By questioning what capitalism does with our hearts, we get closer to the heart of many of our problems.’ It also certainly should not be read, Waitzkin emphasized, as a conspiracy piece, because not the decisions of individuals, but the system in itself was at the centre of his study and critique. Nevertheless, stripped of the ideological anti-capitalist, Marxist, seventies jargon, an interesting (partial) analysis concerning development, introduction and spread of CCUs does occur.

It was Waitzkin’s conviction that every attempt to come to some sort of cost-reduction would fail if the structural relationship between healthcare and the striving for profit by private companies was not taken into account. The short history of CCU made abundantly clear that what seemed to be irrational, indeed was very rational when

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1 O.c., 108, 117-118 (quotation: 117)
2 Waitzkin, ‘A Marxian interpretation’, 1267
3 O.c., 1260-1261
looked at from a capitalistic point of view, not from a medical one. When looked at from ‘the needs of a capitalist system in crisis’, high costs and massive introduction were anything but strange, in spite of marginal effectiveness. For introduction and spread of CCUs (and other, expensive, medical technology) were not only to be explained as a medical answer to a medical problem. One also had to take into account initiatives taken by industrial corporations, the cooperation between medical researchers and capitalist companies, financial injections by private foundations and state support. In other words:

Cost-effective methodology obscures the profit motive as a basic source of high costs and ineffective practices. Health-policy alternatives curtailing corporate involvement in medicine would reduce costs by restricting profit.²

As according to Waitzkin - and almost all other CCU-critics - Mather and Hill had shown, home care was no worse than intensive care, how else could this enormous growth of the number of units be explained? It simply could not be done without taking a close look at the social, economical and political structures stimulating this growth. Waitzkin was convinced that the medical market too had to meet the laws of capitalist economy: growth of production, market and (for that and because of that) profit. This sometimes caused over-production, also in the medical

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¹ O.c., 1267
² O.c., 1260
world, in which on top of that an over-production of intensive care fiercely contrasted the difficult admittance of many to even the most rudimentary form of healthcare.¹

Although the role industry played in setting up CCUs - or the expansion of healthcare in general - was a fairly original topic, Waitzkin was not the first one to describe it, as for instance the example of Farrier in 1964 proves. In any case, the questions they raised were anything but unjustified. This is for instance shown by the Hofvendahl-research. He received from several industrial magnates, such as Hewlett-Packard, free apparatus in behalf of his original small CCU, which, as seen, later on was replaced by a bigger one. Together with the fact that this latter, big CCU already was taken into practice before the data of the research undertaken in the original CCU were evaluated, this raises doubts whether Hofvendahl had the necessary objective point of view when coming to his interpretation of his data that turned out positive for CCU. For instance, the free products made it impossible to make a to some extent valid cost-effectiveness analysis. Hofvendahl admitted this fairly, but did not see it as a problem, although, as seen, it did not withhold him from making statements on the costs of CCUs anyhow. In fact he was quite happy that he was not able to make such an analysis. It would place him for some ethically unsolvable problems, because life or health were not measurable in hard coinage.²

¹ O.c., 1262
² Hofvendahl, ‘Influence of treatment’, 61
This, however, does not take away the fact that industrial ties from a medical point of view could really cause some problems. For that influence was huge. Not for nothing conferences often, if not always, were organized at places with enough space to show off the technological equipment at its best. On these conferences doctors were amply treated and fêted. This most certainly has influenced some, if not many - for otherwise it would have stopped - and it might even have corrupted a few. According to Dunning, the in his view too far-reaching influence of industry was proved by the fact that schooling courses had moved into the hands of pharmaceutical industries, hardly an independent teacher.\(^1\)

All in all, it is hardly surprising that Waitzkin spend an ample amount of words pointing at big companies, always looking for a nice profit, which in the United States participated in all but every part and every phase of the development of the CCU. He especially aimed at Warner-Lambert and Hewlett-Packard, but they were mere examples. Although high-ranking they were just two out of almost a hundred firms involved in the development and introduction of the CCU. Warner-Lambert especially participated through American Optical, taken over in 1967, a firm closely involved in developing CCU-equipment from the beginning. According to the Warner-Lambert’s 1966 annual report, in this year the number of American Optical Coronary Care Systems installed in American hospitals tripled. Although competition of small as well as big companies in the field of CCU-technology would

\(^1\) Interview A.J. Dunning, Abcoude, 4-9-2000
increase, the conviction was and remained that American Optical would remain a leader ‘in this evolving field’.¹

After taking over American Optical, Warner-Lambert further expanded its working field. Doctors and medical centres were flushed with propaganda material with - unproven - figures on the positive effect CCU-care had on coronary and heart patients. It is remarkable that several apparatus, every year renewed and restyled, were named ‘Lown’. Although expansion in itself lasted until the beginning of the seventies, Warner-Lambert already in an earlier stage noticed the signs of American market satiation. To stay ahead of its effects, new countries were explored, especially in the Third World, such as Argentina and Colombia. Sadly enough, the annual report of 1970 said, political developments in Chile and Peru somewhat delayed further growth.² It alluded to developments in state directed socialism since the end of 1968 when Valesco Alvarado had become president of Peru and to the rise to power in 1970 of social-democrat Salvador Allende in Chile.

A second method to overcome market satiation was further diversification of supplies within the coronary and heart-market and/or artificially making existing CCU-apparatus obsolete, so renewal would be ‘necessary’ in an earlier stage and in an increasing pace. This led to the remark in the 1975 annual report that new instruments ‘helped contribute to record sales growth in 1975, following an equally successful performance in the previous year’. Also Warner-Lambert turned to en-

¹ Waitzkin, ‘A Marxian interpretation’, 1262-1263
² O.c., 1263
hancing the use of apparatus for new territories, especially on the field of prevention. Several instruments were put in the market able to warn for a coming infarction or a possibly oncoming rhythm disturbance.¹

Until the beginning of the sixties electronics tycoon Hewlett-Packard was only a minor player on the medical market. But with the rise of electronics for hospital use this changed completely, and it was the CCU that brought about this change. According to Waitzkin, Hewlett-Packard started an aggressive campaign to sell CCU-technology to hospitals emphasizing over and over again how effective they were in reducing death from myocardial infarction and rhythm disturbance. Many times the *Hewlett-Packard Journal* went into CCUs and the enormous use Hewlett-Packard apparatus could have in these units. For instance, in June 1967 the ‘laboratory group leader for the design and development of patient monitoring and display instrumentation’, H. Ronald Riggert, pointed out that technology was playing an ever increasing role in the medical world, and especially in the world of the mortally ill.

For example, through continuous electronic monitoring of individuals admitted to hospitals after acute coronary occlusions, hospital mortality from this most common cause of death has been reduced from its former value of 40% to 20%. The impact of this sin-

¹ Idem
gle example is striking when one considers that some 600,000 Americans will die this year from occlusive coronary disease.

This, of course, sounded very convincing, were it not that the presented reduction data were unproven, and the majority of the 600,000 patients would never reach hospital let alone CCU, and therefore could not benefit from the presented care either. This, however, did not withhold Riggert from speaking highly of the machinery that was developed in his Sanborn laboratory. Especially the Sanborn-ECG had caused huge mortality decline, because through it ‘the exact nature of the problem’ could be determined and therefore care could be given more adequately. No wonder he concluded that the ‘life saving equipment’ would without any doubt play an increasing role in caring for the severely ill. Although the development of the monitoring instruments in many ways still was in its infancy, it had already lead to remarkable results and so ‘medical directors were sure that tens of thousands of lives each year will be saved through wider use of intensive care programs employing patient-monitoring equipment’. In fact, the growth of the number of monitoring units was only limited by the lack of specialized personnel, and Riggert therefore expected that in the near future

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2 O.c., 4-6
3 O.c., 11
almost every large hospital would attain monitoring apparatus and
place it in units especially designed for them.\footnote{O.c., 10-11}

Two years later, this picture was once again underlined by Riggert’s
colleague Thomas North. Pointing at the article of Lown, ‘The CCU:
New Perspectives and Directions’, he too adduced that since the intro-
duction of heart monitoring apparatus ‘significantly improved recovery
rates in hospital coronary care units’ were detected. But still more could
be done, not by solving problems, but by preventing them. And in this
as well, Hewlett-Packard instruments, like the Arrhythmia Monitor,
were not to be missed. Quoting from an article of the Hewlett-Packard
Company itself, he ended his piece by stating that as a consequence of
ECG-use immediate mortality reduction was sixty percent already.\footnote{Thomas C. North, ‘Premonitory Heartbeat Patterns Recognized by Elec-

In the annual reports was spoken highly of Hewlett-Packard CCU-
apparatus on a regular basis as well. For instance in 1966 it was stated
that in the CCU of a Nevada-hospital ‘the system has alerted the staff to
several emergencies that might otherwise have proved fatal, and the
cardiac mortality rate has been cut in half’. Three years later, it was no-
ticed that each year hundreds of lives were saved ‘with the help of
Hewlett-Packard patient monitoring systems installed in more than
1,000 hospitals throughout the world’. As an example, a photograph
was included of a CCU equipped with Hewlett-Packard apparatus in
Montevideo, Uruguay.\footnote{Waitzkin, ‘A Marxian interpretation’, 1263} This last detail was presented by Waitzkin in
his article as well, and one can imagine why. The money spent on a CCU could have been spent differently there, in a way that many more lives would have been saved. Furthermore it proved that Hewlett-Packard in an early stage already concentrated on sales outside US-boundaries. Already in the 1966 annual report it was stated that the effects of a shrinking economy could be annulled by ‘the great sales potential for our products, particularly medical instruments, in South American, Canadian and Asian markets. These areas should support substantial gains in sales for a number of years.’ Amongst those markets were Singapore and Malaysia where Hewlett-Packard, because it received a so called ‘pioneer status’, was not obliged to pay any taxes on the profits made.¹

Because of CCU, in fifteen years Hewlett-Packard had grown into an international tycoon in the medical field, active in no less than 64 countries. But like Warner-Lambert, Hewlett-Packard as well tried to avoid the negative effects of market saturation in other ways, and it too made use of diversification. Time and again, new instruments were developed that, according to the 1971 annual report, ‘contributed to the substantial growth of our medical electronics business during the past year. With this growth has come increasing profitability as well.’ Part of this strategy of expansion and profit growth was for instance the development of electrocardiogram-apparatus on batteries for regions in which electricity was not even available for more traditional machin-

¹ O.c., 1264
Again the suggestion of Waitzkin, in writing it down, is clear. If the company really was interested in healthcare, it would have done something about the social-economical arrears in general before selling expensive technology that at most contributed to the health of a happy few. It all became clear in a 1973 Hewlett-Packard statement.

Health care expenditures, worldwide, will continue to increase significantly in the years ahead, and a growing portion of these funds will be allocated for medical electronic equipment. Interestingly, this growth trend offers the company [...] the unique opportunity to help shape the future of health care delivery.

The hardly unexpected commentary of Waitzkin was: ‘From the corporate perspective, spiraling health-care expenditures, far from a problem to be solved, are the necessary fuel for desired profit.’

An item that also should not be neglected when trying to explain the swift spread of CCUs, is the tie of industry with (leading characters of) medical centres. For instance, American Optical already before the takeover by Warner Lambert, strongly worked together with Peter Brent Brigham Hospital and especially with Lown himself, who, as said, would give his name to several American Optical instruments. He was the American Optical medical advisor and so one of those doctors not only using, but also developing medical machinery. Waitzkin:

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1 Idem
2 Idem
3 See f.i.: Gelijns, ‘Innovation’, 32
'Lown pioneered the theoretical basis and clinical application of these techniques; AO engineers collaborated with Lown in the construction of working models.' This of course makes it a bit hard, when asking whether some machines should be purchased, to keep some critical distance. The ties of American Optical with Peter Brent Brigham were made clear in another way as well. The CCU developed there in the midst of the sixties received ample grants from the company. In return American Optical received data and photographs. They could be used as promotion material, intended for other doctors and potential investors. With great regularity Lown and his colleagues published on the findings in their CCU, in general medical as well as in specialized cardiologic journals, and these articles spoke highly of the use of automatic monitoring. Especially the general use of telemetry on behalf of mobile patients and computerization of data-analysis were recommended full heartedly. This was exactly two of the territories of American Optical diversification strategy at the end of the sixties and the beginning of the seventies. Waitzkin: ‘The dynamics of heightened profits for AO and prestige for Lown were not optimal conditions for a detached, systematic appraisal of CCU effectiveness.’¹

This criticism deserves at least one remark. However true and valuable all Waitzkins comments may be, one does not escape the impression that from time to time he too points his accusing finger at individual persons, and not, in spite of his own words, just at ‘the system’. And of course all these financial ties will most certainly have influenced the

¹ Waitzkin, o.c., 1265
decisions and writings of Lown and his colleagues and therefore justify question marks at the objectivity with which decisions were made and articles written. Nevertheless one wonders whether Lown was the right person to aim at. This champion of nuclear disarmament and, through his leading role in the International Physicians for the Prevention of Nuclear War, co-winner of the Nobel Peace Prize 1985, could hardly be accused of anti-social behaviour. Waitzkin does not do that explicitly, but the suggestion most certainly is there. Moreover, it is anything but clear whether Lown used the money gained by his ties with American Optical for his own sake, or for further research. Again Waitzkin does not write explicitly that the first option is the correct one, but again this will have been the supposition of his readers.¹

As said Hewlett-Packard’s medical centre was the one of Stanford University, in the direct vicinity of the company’s headquarters at Palo Alto, California. For years William Hewlett, chief executive officer, was director at Stanford and it was supported by the philanthropic Hewlett-Foundation. Donald Harrison, Stanford-cardiologist at the end of the sixties, was the most important heart monitoring advisor of Hewlett-Packard. In cooperation with technicians of Hewlett-Packard, of which at least one came from Hewlett-Packard’s space program, he and his

colleagues worked at the development for care units destined for use in academic as well as non-academic hospitals. The systems developed by the company were tested and evaluated in Stanford medical centre. As seen, the resulting innovations had a huge effect on the cost of Stanford hospital’s medical care. As Lown on his Peter Brent Brigham CCU, Harrison and his fellow cardiologists often published about the Stanford CCU and they too wrote highly on the advantages of modern technology. Every once in a while even the companies name, Hewlett-Packard, was mentioned.¹

By mentioning the Hewlett-Foundation, Waitzkin got round to his third influencing item: philanthropic foundations and organizations. Concerning CCUs the most important one in the United States was the American Heart Association. It amply supported several conferences on the units and CCU-projects. The goal of this was, according to the 1967 foundation’s annual report, promoting and guiding of new units in big hospitals as well as small ones, and the development of a CCU-program in the entire country. The Association justified this by pointing at its experience with the about three hundred units existing at the time. They had shown that an entire network of units could save up to 45,000

lives annually,\textsuperscript{1} a number as seen first mentioned by Day, of which the extrapolation arguments are cloudy to say the least.

Other institutions financing and supporting CCU-programs were for instance the Hewlett- and Hartford-Foundations mentioned earlier. According to Waitzkin the interest of these foundations in the units was anything but remarkable. First of all, the major part of their money came from technological and pharmaceutical industries and therefore many of the foundations managers had - also in the form of foundations stock itself - a financial interest in technological or pharmaceutical industries or in the hospitals themselves. But also they simply were interested in everything concerning technological innovation, convinced as they were that this was a good thing in itself.\textsuperscript{2}

The fourth branch of Waitzkin’s CCU-supporting tree was the state itself. Not surprisingly, it was a tree that made his Marxist disposition fully blossom. The social unrest of those days of racial struggle and Vietnam-war made CCUs even more interesting for the state. By supporting and investing in heart monitoring technology it gave off a signal of humanity and concern with public health, while at the same time strengthening the capitalistic system because of the major role big companies played in developing and introducing the units. The supporting state activities were connected with the general support it gave to all kinds of things important for the countries economical well being. The state, so Waitzkin wrote, therefore would not be very willing to develop

\textsuperscript{1} Waitzkin, ‘A Marxian interpretation’, 1265
\textsuperscript{2} Idem
policies restraining companies profits. In view of the high cost of CCU-care, of course it could have set limits to the number and spread of the units. For instance, the ministry of Health could have pleaded for centralization of CCUs in major regional hospitals, pointing at research showing that the bigger a unit, the greater the benefit. But in fact it did exactly the opposite. ‘By publishing guidelines that called for advanced CCU technology and by encouraging CCU proliferation to most community hospitals, HEW [the ministry of Health, Education and Welfare. LvB] assured the profitability of corporate ventures in the coronary-care field.’

The critics criticized: the theory of fools
Of course all this CCU-battering was retorted, sometimes thorough and with respect for critics and their arguments, sometimes arrogant as if raising doubt at CCU-effectiveness was insane from itself. For instance, in his discussion with Selzer, Lown asked what the point of all this criticism was and directly answered himself: it was mere jealousy of all those university institutions that did not have the lead in CCU-development. This, of course, can very well be the case, but sadly enough for Lown, the reason for giving critique, says next to nothing about its content and validity.

Ten years later M.F. O’Rourke cum suis still did not grasp it. All these critical articles on heart monitoring were mere minority views

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1 O.c., 1266
2 ‘Controversies’, 599
and on top of that all falsified. Sadly enough, because of the cutting in budgets going on since a couple of years, the critics found a willing ear with health authorities, showing that O’Rourke certainly did not share Waitzkin’s view on the role of the state in CCU-development. Although O’Rourke too could not make a calculation of CCU-cost, in his view the units were medically as well as economically justified.¹ This aversion against relating medical measures to the costs they bring we find as well in the critique-critique of J.M. Rawles and A.C.F. Kenmure in the 1980 *British Medical Journal*. They were completely stupefied that, although already in 1975 the Joint Working Party had emphasized the usefulness of CCUs, CCU-critique had come into its own. This just had to lead to a revaluation of everything connected with intensive coronary care, such as MCCU, ICCU and of course CCU itself. And that was what they did. However, the question remains whether the way they did it, will have convinced a lot of their adversaries. Already, according to Rawles and Kenmure, the first tests in Belfast had proven that MCCU was lifesaving and feasible. Sure, the data received were not attained by randomised trial. But this simply could not be the case because such trials were impossible as well as unethical. The debate on ‘home versus hospital’-treatment was simply called irrelevant. Tests undermining ICCU-usefulness had been methodologically unsound or lacked general validity, while tests demonstrating positive effect were classified ‘convincing’. Moreover, things like cost-effectiveness were abhorrent to

them. Which mortality decrease justifies the introduction of MCCU, ICCU or CCU? Clearly the rhetorical answer was ‘every’.¹

No wonder, although of course some showed their approval by means of letters to the editor,² Hill and his colleagues were anything but impressed. They explained that a number of propositions of Rawles and Kenmure concerning their research were false, and hence the conclusions were false as well. So they left intact their - mildly worded - conclusion that for a majority of patients visited by a general practitioner because of a suspected myocardial infarction, hospital care had not shown any demonstrable advantage. Although not directly directed at Rawles and Kenmure, their closure was clear at the least, if not deadly. They hoped that further research would enlarge knowledge and have the consequence that the debate on ‘community coronary care’ in the future could be held ‘within a rational rather than within an emotional frame of reference’.³

The CCU-critics, and especially the principal adversaries, will have been more startled by Bernard Bloom’s reaction to the Waitzkin-article, for Bloom was considered to be one of them. Under the significant title ‘Stretching Ideology to the Utmost’ he, it is true, agreed with most of Waitzkins practical objections, but he fiercely attacked its ideological background. To explain CCU-growth and blossom it was anything but

necessary to drag in capitalism. One only needed to take a look at the medical class itself.

Bloom started his story remarking that he would withstand the strong urgency to compare all the pro’s and con’s of a free, democratic, capitalist society with the pro’s and con’s of a communist, or better: state-capitalist society. That urgency was strong, precisely because Waitzkin saw capitalism as one of the explaining factors behind CCU-rise, instead of picturing it as an ‘unusually good example of technological development with rapid, uncritical dispersion, a phenomenon common to medical care systems under any political and economic system’. Sure, this rise had been swift to say the least, and without any randomised trial showing its effect beyond any reasonable doubt. And even after these trials had been executed, such as Mather’s, there hardly was any influence on the pace of growth. According to Bloom this could only mean one thing: ‘When a technology may be of benefit to only a minority of patients with specific characteristics (as with CCUs), it has proved difficult to prevent its indiscriminate (hence costly and ineffective) application.’ Believing a technological innovation is useful becomes the same as knowing and (therefore) seeing it indeed works.

In this Alice in Wonderland situation, Dr. Waitzkin has unwittingly fallen into the trap of allowing an ideology to shape an explanation for a curious phenomenon which he has correctly observed.¹

Bloom wondered if industries really ‘palmed’ their stuff upon ready doctors, or did they - in first instance - live up to doctors’ wishes? He thought the latter much more likely. Are doctors really that easily persuaded to buy all kinds of expensive technology, or will they purchase only the technology of which at least they think it will have some use for the patients? Again Bloom thought the latter the most likely. Moreover, Waitzkin could hardly deny that CCU-technology was used in non-Western, non-capitalistic countries as well, although on a scale less broad. The explanation was that there too doctors believed it be effective, and therefore, because in these countries too they were the most important decision makers in hospital policy, they bought the stuff of which they had seen effect, or at least of which they thought they had seen effect. Giving this up had nothing to do with ideology but merely with shortages in hospital funds.\(^1\) That Warner-Lambert had said that developments in (state)socialist direction in Latin-American countries would be bad for market because medical wishes would encounter more political objection, he hardly thought relevant.

On the relationship between medics and industry, Bloom said that this perhaps could lead to a mutuality of interest, but nevertheless ‘a desire to tackle a grave problem rather than cupidity led to the acceptance of CCUs’. One may not forget, that the first CCU was opened in the beginning of the sixties, but it was almost twenty years later when Bloom wrote his Waitzkin-reaction, and then heart and coronary com-

\(^1\) O.c., 1270
plaints were the major cause of death. So it was only logical that every solution of (a part of) the problem was grasped with both hands. And one has to admit that CCU seemed to be a logical solution for at least one of the problems: rhythm disturbances after infarction.

It was all very logical as an hypothesis lending itself to a technological approach. American Optical and Hewlett-Packard were only among the first to discover the connection and exploit its marketing potential. [...] In short, one need not resort to Marxian ideology to explain the development of CCUs and the medical profession’s uncritical and enthusiastic acceptance of a technology that was not adequately evaluated. The profit motive may have helped accelerate the speed of the technology’s dispersion but it is not the villain pulling the strings behind the scene. An alternative analysis of this development and growth could be based on a theory of foolishness - that cardiologists, third-party payers and policy makers accepted weak evidence for CCU effectiveness and incorporated it as one of their fundamental beliefs. An analysis postulating a capitalist, profit-oriented basis for CCU implementation and growth has little to do with making sense of therapeutic or medical policy nonsense.¹

Of course, Waitzkin exactly hit the nail with his remark that medical technology was over-presented to doctors as well as to the general public. The advantages of all new technology indeed were emphasized over

¹ Idem
and over again, leading to expectations impossible to prove. But this was the case with all but every new item amply bought, be it for stimulating unbridled lust or reducing weight without having to move more or eat less. Effectiveness of those remedies was seldom proven as well, often enough even the opposite was true. But did this mean they had to be forbidden, when they turned out to be innocent?

I think not, for the rights of the individuals to be fools is no doubt just as important, and human, as are their Constitutional rights. It is primarily when great harm is possible, when the market fails, as in medical care, or when the monies are spent, that government can and should effectively intervene to control, modify, own, or regulate.

According to Bloom on the whole there was nothing wrong with these conditions in the medical world.¹

Thereupon Bloom wondered how introduction of new technology should proceed. For this, he even turned to the old article of Cochrane, *Effectiveness and Efficiency: Random Reflections on Health Services* (1972), in which it was stated that money for introducing new technology should not be made available before it had been submitted to ‘rigorous clinical investigation by the most appropriate statistical technique, preferably by double-blind, random-controlled trial, or, if this is not possible, the next best statistical study design’, something already introduced for

¹ O.c., 1271
pharmaceuticals. According to some, every once in a while this would lead to inaccessible delay, but nevertheless in itself it was not a bad idea. But the best idea, according to Bloom, was to stick to capitalistic free-market self regulation, which ‘for all the ills […] still is the most efficient’,¹ a point of view showing that Bloom too was not entirely free from ideological feathers.

¹ Idem
6 The Introduction of the Unit for Intensive Heart Monitoring in the Netherlands

After all these discussions on relevance or irrelevance of CCU-care, the question of course is: how did the introduction in practice proceed? In the following I will try to explain this in short, using the Dutch example.

Three years after the first CCUs saw light and one year after the first extolling articles in internationals journals, the first two units were introduced in Dutch hospitals. Two years later, in 1967, the third one appeared and from then on they emerged one after the other with accelerating speed. Within four years the Dutch CCU-percentage even clearly outnumbered the American. Although this of course was also due to geographical circumstances, more importantly the introduction took place at a time heart- and artery diseases were internationally and nationally seen as a major medical, social and political problem.¹ Not for nothing, the Dutch Heart Foundation was erected in 1964. Furthermore care of the heart - this motor of life, the combustion-engine of the body - spoke to imagination. Heart surgeons were the medical heroes of the time. The Dutch cardiologist Durrer was frequently hailed on international conferences as well as in Dutch papers.²

² F.i.: ‘Prof. Durrer was Held van Congres in Miami. Hartkwaal in beschaaerde wereld “mensenkiller” nummer een’, in: De Volkskrant, 29-10-1965, 11
In the Netherlands too the swiftness of introduction - dozens of units within a couple of years – can be explained by imminent results obtained in existing CCUs. Upon this in 1971 the Dutch Health Council published an *Advice on Heart and Artery Disease*, asked for by under-minister of Health R.J.H. Kruisinga. Amongst others it was set up by cardiologists E. Dekker and C.L.C. van Nieuwenhuizen, both aligned to the CCU-propagating Dutch Heart Foundation. Utrecht-cardiologist Van Nieuwenhuizen, Antonius-hospital, also played a major role in the European department of the World Health Organization, that also was convinced of the blessed task CCUs could play. Leading doctors and the Nederlandse Hart Stichting (Dutch Heart Foundation; DHF) put pressure on the introduction of the CCU in Dutch hospitals and its success certainly is partly due to the fact that in the crucial years 1967-1971 former doctor Kruisinga had public health in his portfolio. He made the battle against heart and artery disease into a personal crusade, nationally as well as in the WHO-European department of which he too was a member. Although cardiologists as Van Nieuwenhuizen always mocked Dutch politicians for doing too little and spending even less, neither within the Dutch government nor within the Second Chamber, the Dutch House of Commons, Kruisinga met with resistance of any importance when asking for constantly increasing budgets. Consequently, the Dutch government did not call upon limitation of beds on a

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regional basis or a couple of tests before massive introduction, as was proposed by some in the international arena. Instead it fully supported the growth the medical community wished for. In fact, Kruisinga did not only offer no counterpoise against the wishes of cardiologists, Heart Foundation (and industry), he simply was part of the lobby. Through old ties of friendship and the WHO he upheld close relations with Van Nieuwenhuizen, who as said was aligned with the Heart Foundation. This in turn had a leading man of the Philips-company in its board, a man already interested in the DHF a year before it actually came into being. In fact, the relationship between Van Nieuwenhuizen and Kruisinga was so close that a link can be supposed between the attacks on politics by the former, and the fact that always shortly afterwards new propositions by the latter followed.

In the mentioned advice of the Health Council a chapter was written on the introduction of CCUs. Not only a man like Van Nieuwenhuizen was part of the advisory-committee, this particular chapter was written by cardiologists Vonk and Dekker. As a result the contents hardly came as a surprise. It should have been known - in fact: it was known - that it was no independent advice. Not only because of the

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functions of men like Dekker and Van Nieuwenhuizen, but also because both had written articles on the subject earlier in which they spoke highly of CCU-effectiveness. Moreover, - and this was known as well - their view was broadly shared within the advisory-committee. Nevertheless, to make completely sure nothing would go wrong, they had pre-selected the doctors of which they gained further information. Only internists or cardiologists already in charge of a CCU or internists and cardiologists in want of one were invited to a meeting in which the contents of the advice were discussed. So, men who maybe would have a dissenting opinion were not invited and therefore could not take part in the deliberations.

In this process some things need consideration. Certainly also in the Netherlands CCU - a unit actually called: unit for intensive heart monitoring - was at least in part a result of despair and not only of ingenuity. It was shown that heart and artery diseases played a growing role in causes of death - although this in part was a mere consequence of better health in general and therefore rising of age, and the almost total eradication of tuberculosis. In part heart disease therefore is a problem cre-

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ated by solving a former one.¹ Be this at it may, the growing role of heart and coronary disease in mortality gave the cardiologists a chance to claim a bigger part of internal medicine as their field. The technological CCU was extremely well suited to give this expansion a face. It had an attractive radiation, contributing as well to the growing number of cardiologists since the mid sixties. Furthermore it was to the liking of nurses who got more responsibility and higher wages. The general practitioner as well, at least at first, was charmed by the concept because it freed him from a number of laborious patients. It was CCU that gave cardiology the chance to become a real hospital specialty. CCU firstly gave higher status not only to the specialty itself, but also to the hospital as well as to the city the hospital belonged to. And secondly the cardiologist could say farewell to his former life, which resembled that of a general practitioner, moving from patient to patient taking with him all kinds of heavy material. From now on the patient would come to him. This made possible the battle with internal medicine over the cardiac patient. Without hospitalisation of the cardiologic sub-specialty this battle could never have been won, or even started. Therefore it can be stated that the victory march of the CCU and the emancipation of cardiology not only took place at the same time, but went hand in hand. Or even better: the massive introduction of the CCU was the emancipation of cardiology. Because of the CCU, cardiology became a specialty next to internal medicine, instead of a sub-specialty of internal medi-

cine. So introduction of CCU had an interest surpassing mere medical reasons.

Furthermore, several epidemiological studies on heart disease - in which by the way the Netherlands contrasting for instance the United States did not do bad at all - had triggered a discussion on the hazards of fa(s)t food, smoking and lack of exercise. But a number of CCU-propagating doctors saw no possibilities for successful prevention. These hazards simply were part of Western lifestyle - including their own. Of course one could point at the danger of smoking and it certainly should be done, but they did not expect much of it. However, on the political and social agenda prevention scored better than curative intervention. This problem was solved by several cardiologists as well as Kruisinga himself by turning the CCU into a preventive concept, greatly indebted to Lowns ‘preventive treatment of rhythm disturbances’, the most important alteration the CCU-concept had been through in these years. For this the meaning of the word ‘prevention’ was changed from prevention of heart disease into prevention of aggravation of heart disease, the prevention of life endangering complications following an infarct. This could, should and would take place in the CCU. Kruisinga admitted that by using the word ‘prevention’ it would be easier to get government funding for erecting and equipping new units. In other words: by giving the word ‘prevention’ a new meaning the discussion on prevention of heart disease provided a fertile ground

1 F.i.: Dekker, ‘Bestrijding’, 850.
2 Advies inzake de bestrijding, 7.
for the emancipation of cardiology and it managed to give a swing to that discussion in favour of introducing CCUs. After CCUs had become a completely accepted part of hospital practice in the midst of the nineteen seventies, the old meaning of the word ‘prevention’ was restored.¹

This also explains why, as in the hospitalisation lascivious United States, an especially in Great-Britain oncoming discussion on ‘home versus hospital’-treatment, never gained much ground amongst Dutch cardiologists.² They argued that of course in Britain this could be the case, seen the sorry state British hospitals were in.³ But again this was not the only reason. CCU had just been accepted and introduced on a large scale, and now the patient was brought to the machine, only recently, in co-operation with the DHF, a campaign had started to bring the machine to the patient. Things like MCCU were discussed. Defibrillators were placed in football stadiums, bringing a cynical columnist to remark that our beloved Dutch players - who were not doing badly in these days at all - had to restrain from making a game exciting. With its, I quote, ‘murderous bla-bla’ and ‘unproven scientific horror-stories’ the DHF had managed to make not only smoking and eating but also football into a life-threatening affair.⁴ When football is touched criticism always emerges.

¹ A.C. Arntzenius, Curatieve en Preventieve Cardiologie, Leiden 1974.
³ Ibidem.
The reason behind all this was that no patient should be kept away from CCU. Instead more and more patients should gain access and on a continuously easier basis. The role of the general practitioner should not grow, it should get smaller and smaller. And before getting to hospital technology, not the family doctor but mobile technology and specialized nurses should be at the bedside.¹

A discussion on the advantages of home treatment therefore came at the wrong place at the wrong time. It simply was not taken seriously. The research showing that home treatment was at least not deadlier than hospital treatment was criticized on scientific grounds,² this also in the Netherlands, in contrast to inquiries with even greater methodological mistakes, or scientifically resembling inquiries, but showing profitable effects of CCU-treatment. No criticism there. One cardiologist even said that maybe five years earlier the general practitioners would have had a point, but not in the midst of the seventies, as the CCU had evolved into a state of art concept of which the advantages could no longer be denied.³ It is striking that this doctor in fact states that the general practitioners would have had a point in the days the Advice on Heart and Artery Disease was published. But the conclusion of that advice as well was that every heart patient should be brought to a hospital and preferably to a CCU.

Nevertheless cardiologists did not get their way completely. Bob Dylan was proven right. At the beginning of the seventies the times at least began to change, although not exactly in the way Dylan wanted. Slowly the sky no longer was the limit and cost-effectiveness began to lose its repulsive sound.¹ Medically the sacred eye of the doctor no longer was sufficient proof. By the time the CCU-victory march was all but complete, evidence based medicine began its own. This had to have consequences. Shortly after Kruisinga left office, Dutch cardiologists and the DHF were lobbying for massive introduction of - extremely expensive - MCCUs,² but the political answer was ‘no’. This despite the fact that, as had been the case with CCU-research, inquiries in Belfast and Moscow at least seemed to have proven the effectiveness of the device. It was decided that three minor trials should first be held to study CCU-effect of ‘cardulances’ in Dutch circumstances. When the results of the first two tests became known, MCCU-introduction was called off. Nothing was ever heard of the third test again. This makes it probable that CCU-introduction was successful partly because it happened just before a split in a medical era. Its introduction passed off relatively undisturbed because not scientific research, but medical common sense

decided on its effectiveness. Contrary to this MCCU-introduction had to take place in a time randomised trials had come to the fore.¹

On top of all this, one has to point at the role of industry. In the Netherlands as many as 36 factories were active on the CCU-market, such as Philips, Corbin Farnsworth, Hewlett-Packard, Mela and Siemens.² What exactly the influence of these factories on introduction was, remains a matter of interpretation, as clear data are absent and the archives are closed. Nevertheless it is remarkable that, as the medical advice mainly was written by cardiologists, a technological advice, asked for by Kruisinga as well, was completely the doing of a member of the Philips Medical Systems Division. He concluded that CCUs were best of with a certain kind of technological system, and one does not have to wonder which manufacturer that kind of system had in store.³ Most certainly also in the Netherlands there has been some industrial influence on hospital boards and individual doctors - who frequently

were visited by industrial representatives. And certainly this influence will have had its effect on decisions made. But Bloom’s question remains unanswered whether it stood at the beginning of introduction and rise of the unit - in other words: a demand was created - or that a demand was answered meaning that the industrial manipulation only began after medical men had begun to ask for better equipment in their unit or for being able to introduce a unit in their hospital as well. What is all but certain is, though, that industrial influence contributed to the enormous speed of introduction in the Netherlands.

In short: a critical view on the process of rapid introduction of CCUs in the Netherlands, learns that, as the international discussion has shown, this introduction was not merely a result of a medical answer on a medical problem. Pressure groups like the DHF, in cooperation with cardiologists, mobilized public opinion and successfully worked on politics and in majority uncritical media, who in fact could be called part of the lobby as well. As a result, in the Netherlands as well a climate was created in which introduction was screamed for so loudly, that results of scientific research and evaluation did no longer matter. Remarkable in this is a sentence in the Advisory Report that stated that introduction of more and more CCUs was necessary if only

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to avoid a situation in which a hospital without a CCU could be legally prosecuted if a patient would die of heart failure.\(^1\) Partly because of this, politicians did not function as initiators or policymakers, either in debate, nor in practice. They did not take the lead in sensitive introduction, but after ample discussion simply followed medical recommendations until budgetary problems made critical evaluations necessary and unavoidable.

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\(^1\) Advies inzake de bestrijding, 96-97.
A short summary of the international discussion

In the eternal search for extending life expectancy the struggle against heart failure became a major topic after the Second World War. Besides drugs, hope was focused on technology. Showpiece of that technology became the Coronary Care Unit, introduced at the beginning of the nineteen sixties. According to the protagonists, the possibilities were almost endless and they claimed mortality, in particular mortality caused by myocardial infarction, would decline rapidly and enormously.

The first introduction of CCUs took place mainly in the United States in the early sixties. Although they opened with the sentence: ‘The concept of intensive coronary care was born of despair not ingenuity,’ two cardiologists who stood at the cradle of the CCU in America, Lawrence E. Meltzer and J. Roderick Kitchell, presented in a 1972 article the introduction and further development of the CCU mainly as a result of some earlier medical and technological discoveries. That some of this equipment came from the US-space program was in fact the only indication that the CCU - at first nothing more than a tiny space filled with a couple of beds and some monitoring electric equipment, in some cases staffed by especially trained personnel - was not developed in a social vacuum. This not only indicates that the first CCU was not opened by accident in 1962 and not for instance ten years earlier, it also indicates that the development of non-medical technology contributed to its existence as well. Nevertheless: despair was not absent. The CCU was seen
as the medical answer to a medical problem that was considered to be huge: how to diminish mortality from acute myocardial infarction.

There are several reasons for slowing down or even pinch from medical technological innovation. There can be a simple shortage of funds. The problem for which the innovation could be an answer is socially or politically not seen as urgent. Scientific research on a minor scale shows that the result probably would not live up to the expectations. Regarding this, CCU could not have come at a more suitable moment, making the sixties the ideal era for introduction. Money was not yet a problem, evidence based medicine was still in its infancy and media were critical on almost everything except medicine and medical technology. Introduction of the device had been a fait accompli by the time this had changed, in the days of the most fierce medical technology critique from technology sceptics like Ivan Illich or Richard Taylor and Marxists like Howard Waitzkin. Especially the last two undertook a Big Bertha shot at coronary care industry and market.

Not scientific evidence, but the individual doctor who simply saw and knew something would work, decided on the effectiveness of a new device and that was all the evidence he needed. Technologically based solutions to medical problems were embraced worldwide. Faith in advancement was commonly shared and that faith more often than not was the same as faith in technology. In spite of A- and H-bombs, the idea that technological advancement not always has to mean social or humanitarian advancement was still practically absent. Hospitals traditionally are not the most critical buyers of new technology and there
was a strong tie between some of the leading cardiologists and the producers of medical equipment. For instance Nobel Peace Price Winner Bernard Lown, Peter Brent Brigham Hospital, closely worked together with American Optical/Warner Lambert, and Donald Harrison, Stanford University, with Hewlett-Packard.

The research of protagonists such as Day and Lown produced CCU-favourable data, but sadly enough for them critical reflection on the early research as well as new more or less randomised trials, like that of Stefan Hofvendahl or the ‘home-versus-hospital’ inquiries of men like H.H. Mather or J.D. Hill, showed that these data were scientifically based on quicksand, and that the presented reduction figures were questionable, to say the least. Not that the almost entirely positive outcome changed completely, but it certainly got blurred and it certainly got much less positive. The first inquiries had been a comparison between the mortality in a hospital before and after introduction of the CCU at most. But in many cases even this - scientifically questionable - comparison had been omitted. The presented figures were mere personal observations. The figures therefore were not only what they seemed to be, but also a result of hope and expectation, as well as interpretation based on that. But mostly these critical views came at a time when introduction of CCU had been as good as completed, a unit that by that time had changed its main focus several times already.

In its early years CCU looked therefore a bit like NATO after the Cold War: an answer looking for a problem. But because of this search, it time and again did prove its use - at least in the eyes of the protago-
nists - and thus turned into a self-fulfilling prophecy. This raises the question why the CCU had to stay in business after even its most fierce defenders had to admit that the data presented of its effect on its raison d’être - lowering mortality caused by myocardial infarction - were a bit on the optimistic side. In hospitals and above all in society as a whole, a CCU-effect on death from heart disease was in fact very questionable. To counter this the protagonists pointed at the enormous amount of knowledge the CCU had given on the heart and coronary arteries. But CCU-criticizers Bernard Bloom and Osler Peterson answered that knowledge in itself does not lead to reduction of mortality. Moreover, it is wisdom in hindsight. At the time CCU was introduced nobody knew whether it would prove its right of existence in this way, nor did anyone want to.

Medical enthusiasm for an effective answer on a huge medical problem is the normal explanation for this. Leon Gordis, Lechaim Naggan and James Tonascia criticized, in their 1977 ‘Pitfalls in Evaluating the Impact of Coronary Care Units on Mortality from Myocardial Infarction’, the research done up until that moment, including by the way the more scientific ones from the seventies. But although they also doubted some of these latter inquiries, their conclusion was clear: the better the research, the less effect was shown. This once again was proof that the rapid introduction of the CCU was more a result of ‘a wave of zeal and enthusiasm’ than of ‘any objective data demonstrating their effectiveness’.
But this too is not a completely satisfactory explanation. First of all: the first apparent results not only raised doctors’ expectations but also the public’s. Expectations that could not be disappointed. Secondly: the CCUs opened a new and lucrative field for industry. This resulted in non medical kinds of pressure on introduction and it is therefore evident that not only a wave of zeal and enthusiasm explains the ‘I came-I saw-I won’-victory of the CCU between 1965 and 1975.
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