Intermediate coronary care *A controlled trial*

P. C. Reynell

From the Bradford Royal Infirmary

A controlled trial of intermediate coronary care was carried out over a five-year period at a district general hospital. One thousand male patients under 65 were allocated at random into a group kept in the same ward as the coronary care unit (CCU) and a control group discharged from the CCU to a general medical ward. The intermediate care patients were nursed by the CCU staff, resuscitation equipment was immediately available, and there was an efficient emergency call system. The mortality was the same in both groups and no more patients survived cardiac arrest to leave hospital in the intermediate care group than among the controls, though initial resuscitation was more often successful. The failure of intermediate coronary care was attributed to the rarity of primary ventricular fibrillation after discharge from the CCU.

Although the value of the coronary care unit (CCU) is not universally accepted (Mather *et al.*, 1971), there is evidence that patients with myocardial infarction are more likely to survive in a CCU than in a general medical ward (Meltzer, 1968; Hofvendahl, 1971; MacMillan and Brown, 1971), and it is now widely accepted that such a unit should be available at every major centre. However, a substantial number of patients die in general medical wards after discharge from the CCU. In Bradford over a number of years this late mortality accounts for half the total hospital mortality of patients with myocardial infarction. In order to reduce the number of late deaths to a minimum, it has been suggested that patients should be transferred from the CCU to an 'intermediate coronary care area' or a 'progressive coronary care unit' which is administratively and operationally linked to the CCU (Gotsman and Schrire, 1968; Grace and Yarovate, 1971; Whipple *et al.*, 1972). Several centres have adopted such a policy, but its putative benefits have never been proven and they have seldom been questioned. A controlled trial of intermediate coronary care was therefore undertaken at a district general hospital with a busy CCU.

Plan of trial

The Bradford CCU has already been described (Reynell, 1969). Six beds placed at one end of a male general medical ward were equipped and adapted for coronary care.

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Patients were nursed by the staff of the general medical ward, but senior nursing staff were specially trained and rapidly became proficient in ECG interpretation and the techniques of cardiopulmonary resuscitation. Patients are normally transferred to a general medical ward after 72 hours though complicated cases may be kept longer in the CCU. In particular, patients with ventricular fibrillation or severe ventricular tachycardia are usually kept on the unit until their rhythm has been stable for a week.

During a period of 5 years (1969-74) one thousand consecutive male patients under 65 who survived to leave the CCU were divided into an intermediate coronary care (ICC) group and a control group. Patients were randomized according to the day of admission. The ICC group (520 cases) remained in the ward which included the CCU until they were discharged from hospital. They were nursed by the same trained staff as serviced the CCU and resuscitation equipment was immediately available in the ward, though the electrocardiogram was no longer continuously monitored. They were nursed in beds with fracture boards in position to facilitate cardiac massage if necessary. In the event of cardiac arrest, the very high frequency emergency call system on the CCU was activated and this immediately summoned the two house physicians on call to the ward.

Patients in the control group (480 cases) were transferred to a general medical ward on the floor above after discharge from the CCU. In the event of cardiac arrest the procedure was more complicated. A telephone call had to be made to the CCU where the emergency call system was activated. The house physicians on call were thus summoned to the CCU where they collected the resuscitation trolley and proceeded to the general medical ward.

The age distribution of patients in the two groups was similar (Table 1). There were rather more patients in the ICC group, but there was no apparent reason for this.

TABLE 1 *Ages of patients in intermediate coronary care (ICC) and control groups*

Age (yr)	ICC	Control
Under 40	22	19
40-50	128	106
50-60	226	237
60-65	144	118
Total	520	480

Results

Mortality

There was no difference in total hospital mortality between the two groups (Table 2). Two patients died from systemic embolism, but in all the others, death was attributed to a cardiac cause.

Resuscitation from cardiac arrest (Table 3)

In one sense all patients die of cardiac arrest and the decision to initiate cardiopulmonary resuscitation may be an arbitrary one taken by the first nurse on the scene. The fact that resuscitation was less often attempted in the ICC group indicates a more discriminating approach by the trained nursing staff. They were less likely to initiate resuscitation when it was obviously hopeless. On the general medical ward resuscitation was attempted in no less than 36 of the 43 patients who died and some of these were so ill that cardiopulmonary resuscitation was little more than a ritual gesture.

On the other hand, resuscitation was initially successful in 45 per cent of the ICC group as opposed to 22 per cent of the control group. Success was

TABLE 2 *Hospital mortality*

	Patients	Deaths	
ICC	520	44	(8.4%)
Control	480	43	(9.0%)

TABLE 3 *Results of resuscitation attempts*

	Resuscitation attempts	Initially successful	Survived to leave hospital
ICC	35	16	4
Control	41	9	5

defined as restoration of consciousness. But the significant and disappointing finding was that the number of patients surviving to leave hospital was no greater in the ICC group than among the controls. It seemed that a number of bad risk patients in the ICC group were temporarily resuscitated but did not survive to leave hospital. The only net result was that these patients were enabled to die twice instead of once.

Patients resuscitated while still on the CCU

It is pertinent to compare the above figures with the results of cardiac resuscitation on the CCU. During the period under review resuscitation was attempted on 117 patients before discharge from the CCU. In 58 cases this was unsuccessful, but 48 of these were recorded as having cardiogenic shock, cardiac failure, asystolic arrest, cardiac rupture, or some combination of these complications. Of the 59 patients successfully resuscitated, no less than 41 survived to leave hospital (Table 4). These 59 patients may reasonably be compared to the 25 patients initially resuscitated from cardiac arrest after discharge from the unit because nearly all of the latter were returned to the CCU, but only 9 survived to leave hospital. Their ultimate prognosis may have been compromised by delay in resuscitation, but it is more probable that they were poor risks in the first place and that few of them had primary ventricular fibrillation.

Survival after discharge from hospital

The subsequent fate of the 9 patients leaving hospital after resuscitation from cardiac arrest after discharge from the CCU makes dismal reading (Table 5). Seven died at intervals of 2 days to 26 months after discharge, one is a cardiac cripple, and the other had still not returned to work 8 months after returning home. This is consistent with the view that cardiac arrest after discharge from the CCU occurred almost exclusively in patients with severe myocardial damage. The fate of these patients is in striking contrast to the prognosis of patients surviving cardiac arrest on the CCU during the same 5-year period (Table 6). Of the 41 men under 65 surviving to leave hospital, 30 have been followed for at

TABLE 4 *Resuscitation of patients with cardiac arrest while on coronary care unit*

Resuscitation attempted	Initially successful	Survived to leave hospital
117	59	41

TABLE 5 Fate of survivors from late cardiac arrest after discharge from hospital

<i>Control group</i>			
T.T.	- died	3 mth	stroke
H. Wi.	- died	26 mth	cardiac failure
H. Wa.	- alive	13 mth	recurrent left ventricular failure and aneurysm
K.T.	- died	19 mth	myocardial infarction
K.D.	- alive	8 mth	not yet working
<i>ICC group</i>			
J.C.	- died	1 wk	cardiac arrest
J.C.	- died	5 mth	mesenteric embolism
H.R.	- died	2 dy	cardiac arrest
H.M.	- died	1 mth	cardiac failure

TABLE 6 Survival of men under 65 resuscitated from cardiac arrest on the coronary care unit

	<i>Number followed-up</i>	<i>Deaths during year</i>
First year	30	3
Second year	22	1
Third year	11	0

least a year, only 2 are untraced, and only 4 are known to have died. There was a 10 per cent mortality during the first year, a 5 per cent mortality during the second year, and no mortality during the third.

Discussion

The terms intermediate or progressive coronary care have sometimes been used loosely and need careful definition. The minimum requirement of such an area is that it should be geographically adjacent to the CCU and linked with it administratively and operationally. The following advantages may then accrue.

1) The sharing of trained and experienced staff; 2) the ready availability of equipment; 3) continuous monitoring of the electrocardiogram; 4) an efficient emergency call system.

The electrocardiogram was not continuously monitored in our unit, but in all other respects the patients in the intermediate coronary care area appeared to be at a clear advantage when compared to the control group treated in a general medical ward. Nevertheless, their mortality was no less, and no more patients survived cardiac arrest to leave hospital, though the initial results of resuscitation were better.

These results are consistent with the view that the main benefit of cardiopulmonary resuscitation after myocardial infarction is the survival of patients with primary ventricular fibrillation and good myo-

cardial reserve, and that primary ventricular fibrillation is an early complication of myocardial infarction rarely seen after the patient is discharged from the coronary care unit. This must inevitably limit the potential effectiveness of any progressive coronary care system. If a significant reduction is to be made in the late hospital mortality of patients with myocardial infarction, it is not likely to be achieved by extending in time the resuscitation facilities available on coronary care units.

It may be argued that our own intermediate coronary care system was not sufficiently intensive, but further upgrading would in practice mean keeping patients under CCU conditions throughout their stay in hospital, and the findings do not suggest that the benefits would justify the manpower and resources involved.

Today most of our hospitals are postgraduate training institutes and patients should not be segregated into special units without good reason. Young doctors in training require access to a wide variety of clinical experience and it is doubtful if the post of house physician to the progressive coronary care ward could or should be recognized for preregistration training. The same is true of their seniors; few of us wish to become specialists in a single disease, however important. The onus is on those who advocate intermediate coronary care to define what they mean and to prove that it is effective.

References

- Gotsman, M. S., and Schrire, V. (1968). Acute myocardial infarction - an ideal concept of progressive coronary care. *South African Medical Journal*, **42**, 829.
- Grace, W. J., and Yarbote, Patricia M. (1971). Acute myocardial infarction: the course of the illness following discharge from the coronary care unit. *Chest*, **59**, 15.
- Hofvendahl, S. (1971). The influence of treatment in a coronary care unit on prognosis in acute myocardial infarction. *Acta Medica Scandinavica*, **189**, Suppl. 519.
- MacMillan, R. L., and Brown, K. W. G. (1971). Comparison of the effects of treatment of acute myocardial infarction in a coronary unit and on a general medical ward. *Canadian Medical Association Journal*, **105**, 1037.
- Mather, H. G., Pearson, N. G., Read, K. L. Q., Shaw, D. B., Steed, G. R., Thorne, M. G., Jones, S., Guerrier, C. J., Eraut, C. D., McHugh, P. M., Chowdhury, N. R., Jafari, M. H., and Wallace, T. J. (1971). Acute myocardial infarction: home and hospital treatment. *British Medical Journal*, **3**, 334.
- Meltzer, L. E. (1968). In *Acute Myocardial Infarction*, p. 3. Ed. by D. G. Julian and M. F. Oliver. E. and S. Livingstone, Edinburgh and London.
- Reynell, P. C. (1969). Coronary care unit in a general medical ward. *British Medical Journal*, **2**, 502.
- Whipple, G. H., Peterson, Mary A., Haines, Virginia M., Leamer, E., and McKinnon, Elizabeth L. (1972). *Acute Coronary Care*. Little, Brown, Boston.

Requests for reprints to Dr. P. C. Reynell, Bradford Royal Infirmary, Bradford, Yorkshire BD9 6RJ.