

achieved, and correct alignment traction possible during continuous automatic turning.

(8) Marked relief of pain at fracture site has been observed.

(9) Chest complications in susceptible patients have not appeared, and patients who already have contracted chest infections improved rapidly when put on the bed. This is an outstanding advantage to paraplegics and quadriplegics, who may suffer greatly from respiratory embarrassment.

(10) It has been noted that when carrying out intermittent catheterisation sediment has not been allowed to form, or if so is minimal.

(11) Prolonged intravenous infusion has been easier to maintain, as clotting tendency and accidents are reduced.

(12) Urinary reflux cannot occur as the orderly cannot lift the bottle higher than the patient because the drainage tube comes out through the hatch under the middle of the bed, and not over the side, which is the case in standard practice.

(13) It has been noted in some patients that constipation and nausea have set in when they were transferred to conventional beds.

(14) Noise in the ward at night time, caused by personnel, is eliminated, and the patients may have an undisturbed night's rest.

(15) A turning speed of 35° per minute is a speed at which the patient is unaware of the turning motion and yet is fast enough to ensure adequate blood flow in the limbs.

(16) Another minor advantage is that the patient does not suffer from sore ears, which may be a problem on conventional beds. The patient also has a changing field of vision as he turns.

(17) Embarrassment to the patient is avoided when having to use a bed pan as no stripping of the bed is required.

There is a possibility that using this bed a device could be used to handle faecal incontinence. This is under consideration at the moment.

### Discussion

Dr. A. HARDY (*Great Britain*). Thank you, Dr. Keane. Now the meeting is open for question and discussion.

Dr. D. GUREVITCH (*U.S.A.*). I would like to have a few questions. 1. Is that last bed commercially available? How much does it cost?

2. We have heard a good deal in South Africa about the separation of the races. Could I ask how many whites and how many coloured patients were involved?

3. I am amazed, or not amazed, at the enormous difference between the first and the second report which covered essentially the same subject, with such different methods and therapeutic procedures and figures, and seemingly such different results.

Dr. MEINECKE (*Germany*). When I gave my paper on the treatment of broken limbs, Dr. Cheshire from Australia told me that nobody concerned with the treatment of paraplegics will use any plaster casts in the future. Dr. Cibeira told us that a lot of his patients were treated with plaster casts. I would like to ask him, What are the reasons, results, how many complications—pressure sores, what about the alignment of the fracture, and how many stiffness and circulatory troubles did he have?

I think we have a very good method for treating fractures now with ostentesis and you can move the leg or arm, and this is without stiffness and no harm to the skin.

Mr. SWEENEY (*Great Britain*). I'm quite certain that Dr. Keane's bed is a winner. The only small addition that I thought he might have added—he described about the sleeping because of the continuous motion. All I can suggest is that there are many pleasant Irish lullabies which might be added to the bed.

BEDBROOK (*Australia*). I would like to ask Dr. Key a question. When she discussed complete and incomplete lesions, is she talking about the patient on admission to hospital or on discharge? These are two different groups of patients of course.

Secondly, to Dr. Keane—I wonder if a work-study programme has been carried out on this automatic bed. There does seem to be some problems. This does look as though it might be a winner. I wonder if he could tell us first of all—how many maintenance staff are necessary to look after this bed, what the qualifications must be?—because we run a hospital in Western Australia where we've had to employ a full-time engineer, a fitter, to look after all the mechanical equipment associated, not with paraplegia, but with other types of beds.

Thirdly, I'd like to know what spares he carries, obviously a lot of those rubber pieces would need spares, which would necessitate a lot of changing of pieces from time to time, for a number of reasons. What about the linen supply? The hospital has to supply linen to shape all these pieces of rubber, now this must be an awful problem. Therefore, I think that until such has been carried out, on this mechanical bed, and maybe it has been done already, that we should ask for a work-study programme on such mechanical equipment. It all looks very nice, but frankly, when you compare what we are doing at the present time with what might be possible in the future, we must take all this into consideration. And while you say three or four nurses, or orderlies, are you really employing more people in the background?

Professor ADLER (*Israel*). I would like to pursue the thoughts of Dr. Gurevitch from New York, about the contrast of these two first reports. I think it was quite clear from the concluding remark of Dr. Cibeira, that he said, You have to have a spinal unit, and not a general hospital or rehabilitation centre, where the people are admitted after many, many months even an average of 29 months after they have got their injury. This is the answer, in my opinion, to the terrific contrast between these two reports. I think we have to be thankful to Dr. Key for her excellent report, covering successful kind of rehabilitation in these cases, and Dr. Cibeira because he has given an excellent report about not very successful treatment, but under the most trying conditions, the most disagreeable circumstances which have to be changed.

I have the impression that he would like to have them changed.

Dr. TALBOT (*U.S.A.*). Extending on Mr. Sweeney's remark about the Irish Lullaby, recollecting my most recent visit to Dublin, I can assure you that in addition to all of the lullabies, they provide their visitors and patients with other adequate soporifics.

I had the pleasure of seeing the bed which has been demonstrated this morning. I view this with very mixed emotions. On the one hand, I hope I'm not classified as one who disagrees with every new and mechanical device, and has a fixed attitude against automation.

I think, however, that in the treatment of human beings there comes a time when we must pause before we curtail too much the human contact of their care. Patients like to have people around them, they like to have evidence that a lot of people are interested in them. There is some virtue in some patient being turned by two or three people simply because there are two or three people there. There is some disadvantage to the patient being propped with a half-dozen various supporting devices which do the work efficiently. We cannot deny the accuracy of the report, but which somehow or other do not bring to the patient the sense that he is being cared for—a point that is extremely important, because we are treating a whole man.

Another point has come up. Whenever anything new comes along, there's immediately a tendency to say, Is this going to do away with this and that? Is this bed going to do away with so many aids per hundred patients? Of course, there is the question that was raised, how many people do you need in the background to keep these things going? I frankly consider that nightmare point of view, the idea of having 132 of these beds on my service. It appalls me, and I wonder how many engineers we would have. We are not as efficient in engineering as Dr. Keane is, and he is a genius in this field, there is no question about it.

Does one new advantage, even if it is a winner, do away necessarily with something else. It doesn't need to, it can supplement it.

I recently read a report on the use of the retrograde renogram in studying vesicoureteral reflux. The first people who discussed it asked if it does away with the Cystogram. Of course it doesn't. It adds to it. I don't think there is any question that there are patients, particularly the patient in skeletal skull traction, for whom the use of this bed might well be indicated. I shall be happy to have two or three of them on my service, provided I had somebody who knew how to keep the bed working. But I think that in considering a device of this kind, it is essential to consider its specific and best application; not to try to say, this is the answer to all our problems. Certainly, never to forget there comes a limit where it is desirable not to reduce the human touch in the care of these patients beyond a certain minimum.

Dr. JOHN LEIDHOLT (*U.S.A.*). I think that by introducing more attention to the bed, Dr. Keane is bringing about some observations that are physiological which we must investigate. For instance, the atrophy that occurs, not only in bone and muscle with short-time immobilisation in bed, has been really ignored by the medical profession.

The astronauts who were in a Zero-G environment for 10 days, lost 15 to 20 per cent. of their bone density. What happens in the muscle must be far greater than that.

The other feature to be studied is—What does position have to do with arterial and venous circulation in the lungs? New studies with radio-active materials demonstrating the arterial flow in the lung shows that there is a great difference in the anterior part of the lung and the posterior part—and positioning may be very significant. Our experience with healing of ulcer in amputees has been along the same line. We could not get ulcers at the end of a stump to heal with an open-end socket. By applying a material, usually solastic, on the end of the stump, providing a constant massaging effect, many ulcers that wouldn't heal in an ordinary socket or without one, healed. The bed, for all of its mechanical difficulties, is approaching a physiological approach to keeping people immobilised that we must give more attention to.

Dr. GREGG (*Ireland*). The bed is a personal invention of Dr. Keane, and the original models were made by himself entirely. In Ireland we have no difficulty getting nurses or orderlies, we have no financial restraint on what we want in our Centre. The motivation here was not primarily to cut down on staff, though the review shows that it does. The motivation really is the better treatment of the patient.

In the initial stages I acted as a brake on Keane's enthusiasm. I would only let, initially, the worst patients, the people who had started with the traditional pattern, turning on the bed. We tried one or two initially for periods. Many were chesty cases, and it was remarkable that consistently they appeared to improve on the bed. Their chests were better, they were happier, more comfortable. The human contact is all right. But many patients, we find, don't like to be lifted up a foot in the air every three hours by three strong orderlies.

The first point—to rather objectively try and assess it—the patients are unhappy when they come off the bed. Secondly, and this is a fundamental guide, the reaction of the nursing staff. Not in the first year when people are enthusiastic. But do they still want it two years later. And they do. The patients and staff like it.

We are clear in our minds that it helps the chest, it has removed the thrombosis in the legs, etc. I think it is a very major advance mainly for use in centres where the bed can be continuously in use for several patients. I'm not sure it is a thing you can use sporadically.

The bigger field he didn't really touch on. This is the home care of the patients. We have an old man of seventy-three or four—now living at home. They would have had to get their families up three times a night to turn them. The ability to be left there for the night, and be all right until the morning—this will revolutionise the number of severely disabled persons who can live at home. That is one of the bigger fields of this.

I think that while a horse and cart are attractive, there is a lot to be said for a motor car!

HARDY (*Great Britain*). We will close the questions from the floor and try and get some of the answers. I've written down the number, and we will take the speakers in order.

KEY (*South Africa*). Dr. Gurevitch. I'm afraid I haven't got the numbers of the non-whites and whites in this group of 300 at hand. The bed state in the unit is 35 for whites and 85 for non-whites. I hope that answers your question.

I would add that the unit in Capetown is the only one in the Republic that treats all races.

Mr. Bedbrook, in reply to your question. My neurological classification refers to on admission. I just add—we have only had two cases that were complete on admission, who developed recovery, and in both of them, it was so little it was of no functional value.

CIBEIRA (*Argentine*). We have stiffness in the ankle, and some degree of stiffness in the knee in fractures treated by plaster. We believe it was because of the type of fracture, mainly, and not because of the plaster. Years ago, I thought the plaster was very bad, but at present we are sure that it is not bad. If you do the plaster with good technique, and you see and move the patient every day and make all the things that you have to do—I'm sure that there will be no ulcers in the plaster. I discussed with the surgeon many times not to do plaster, but you have to deal with all the patients. If you know everything about the patient, do the plaster. We don't blame the plaster too much. We are not afraid of the plaster.

Second question: I remind you that our patients were admitted to our centre 31 months after the injury. This is our problem. We are fighting with this complication.

KEANE (*Ireland*). I am primarily an engineer, therefore, there is no point in making a machine that will run up the cost of production. The first thing I did after one and a half years was to have a work-study report carried out. We are depending on finance for our medicine, and it is about time we began to introduce automation as far as possible.

This work-study report is done in detail, it is worked out in fact that the ordinary bed costs more to run per year than the other one. The maintenance—there is only one driving mechanism which is a crank which is put in and taken out of gear at the small end. The driving mechanism on the whole costs £15, so that it is a disposable unit. And if there is any difficulty, which we haven't had over two and a half years, you can throw it away and put another one in.

If there is electrical failure you put it out of gear and you turn your patient about three seconds by hand. So even if the patient is on the bed for the treatment of bed sores, the sore will continue to improve with the hand-turning system.

The cost of the bed is about half the cost of treating the bed sore we saw.

HARDY (*Great Britain*). I'm sure Dr. Keane will have available more detailed figures if you button-hole him at coffee.

I just want to emphasise one or two things which were said by Dr. Adler. I do feel

that comparison of methods means a comparison of problems. The acrimonious discussions in this society have been due to the fact that we have not been comparing like with like. We all have our different problems—and out of the 1400 cases that I have seen, have seen two stab wounds. And that is a different problem to those in South Africa. I hear that Dr. Cibeira has seen many bullet wounds, which present compound fractures. When we are talking about things in this Society, then I do think we want to keep in mind that we are comparing like with like or contrasting like with dislike. There is different etiology there are different levels. Dr. Keane, for instance, has more incomplete tetraplegics than I have. I don't know why, but this has to be taken into consideration. There are distances of travel and transfer—greater than in my little area. Most of my cases come within 80 kilometres of Sheffield—a heavy industrial area. Transport is quick. I can see many cases within a matter of five or six hours, and things are very different in five or six hours than what they are in 24 hours. You get many surprises.