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Beyond good intentions: lessons on equipment donation from an African hospital

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Objective In 2000, a referral hospital in the Gambia accepted a donation of oxygen concentrators to help maintain oxygen supplies. The concentrators broke down and were put into storage. A case study was done to find the reasons for the problem and to draw lessons to help improve both oxygen supplies and the success of future equipment donations.

Methods A technical assessment of the concentrators was carried out by a biomedical engineer with relevant expertise. Semi-structured interviews were undertaken with key informants, and content analysis and inductive approaches were applied to construct the history of the episode and the reasons for the failure.

Findings Interviews confirmed the importance of technical problems with the equipment. They also revealed that the donation process was flawed, and that the hospital did not have the expertise to assess or maintain the equipment. Technical assessment showed that all units had the wrong voltage and frequency, leading to overheating and breakdown. Subsequently a hospital donations committee was established to oversee the donations process. On-site biomedical engineering expertise was arranged with a nongovernmental organization (NGO) partner.

Conclusion Appropriate donations of medical equipment, including oxygen concentrators, can be of benefit to hospitals in resource-poor settings, but recipients and donors need to actively manage donations to ensure that the donations are beneficial. Success requires planning, technical expertise and local participation. Partners with relevant skills and resources may also be needed. In 2002, WHO produced guidelines for medical equipment donations, which address problems that might be encountered. These guidelines should be publicized and used.

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الترجمة العربية لهذه الخلاصة في نهاية النص الكامل لهذه المقالة. Al final del artículo se facilita una traducción al español. Une traduction en français de ce résumé figure à la fin de l'article.

Introduction

Health services in developing countries often struggle to meet the demands of a high burden of illness in their communities.¹ Health facilities conspicuously lack technology and it is not surprising when medical equipment becomes a focus for well-meaning donors and hard-pressed recipients. In 2000, the Royal Victoria Teaching Hospital (RVTH), the Gambia's tertiary referral centre, received a donation of more than 20 oxygen concentrators, a relatively simple technology that filters nitrogen from atmospheric air to produce oxygen. Oxygen is an essential treatment for several life-threatening conditions including pneumonia, the single biggest cause of death in children less than five years of

age.² A private group of North American philanthropists had visited RVTH and asked how they might assist the hospital. The chief executive made the request, being conscious of the hospital's oxygen shortage and aware of the advantages of concentrators. The concentrators were received, and a small number of units were put to use initially. Nursing staff reported immediate problems: units typically worked for about 30 minutes before stopping. After an interval a unit would be able to be restarted only to stop again in a recurring cycle. The problem was reported to the donors, who sent a technical assistant to help. Nevertheless, within weeks none of the concentrators remained in use. Local technicians were unable to fix the machines and they were put in storage.

They were shown to a paediatrician (SRH) in the context of discussions among staff concerning oxygen supplies. With the support of the senior hospital management, a case study was initiated to explore the reasons for this failure and to learn lessons that could be applied to the development of locally appropriate oxygen delivery solutions and enhance the success of future equipment donations.

Methods

An assessment of the concentrators was conducted by a qualified biomedical engineer with particular expertise in oxygen concentrators (DP) with the aim of identifying important technical problems. Semi-structured interviews were

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undertaken with eight key informants (a nurse, a technician, a clinical manager, a hospital accountant, a central government health official, a local health-sector nongovernmental organization director, a visiting engineer trainer and a clinician) selected by stratified purposeful sampling to access a range of perspectives. The informants (designated A to H in no particular order) were asked a series of open-ended questions exploring what they knew of the donated concentrators and their understanding of the reasons why the concentrators did not remain in use. All interviews were recorded and transcribed by the interviewer (SEH) apart from one, which was undertaken by e-mail using written versions of the questions normally asked in person. Interviews were analysed using content analysis and inductive approaches, based on grounded theory methodology, to construct the history of the units and the reasons for the failure.^{3,4} Interviews were undertaken between May and December 2004. The project was approved by the Gambia Government–MRC Laboratories Joint Ethics Committee (L2004.E15).

Results

The informants

All informants approached agreed to participate and gave written informed consent for interview. Six of eight had direct knowledge of the concentrators, shown in Fig. 1, and all had knowledge of the local context. Six informants were Gambian and two were non-Gambian.

What caused them to fail?

An account of the episode is presented in the introduction, and is consistent with the reports of the six informants with direct knowledge of what happened. Reflecting on the episode, informants identified three causes for the failure of this venture: technical problems with the concentrators, limited capacity in the health service to appropriately use and maintain the concentrators, and problems with donations.

Problems with the concentrators

Almost all interviewees identified technical problems with the concentrators as important. The perceived reasons for their technical failure included unsuitability for the climate, age and electrical issues.

“First of all, when you put these oxygen concentrators on, they would work for a while, maybe 30 minutes, and start alarming. I don’t know whether it would be overheated ... but I was thinking that maybe the temperatures were not right, maybe the temperatures here were not right for it.” (B)

“Well, one of the things I noticed when I saw them was that they didn’t look new at all. So I asked whether they were received new or used, and I was told they came in used. And that some of them were working fine, but quite a number of them were not functioning.” (D)

“We were told that ‘We have oxygen concentrators up in the room.’ And we went there to see them as soon as we were asked to, to fix up the mains problem. We realised they used 120 volts, so we have to buy step-down transformers. We bought transformers for five or six, we placed them in the intensive care unit (ICU) and the medical wards and paediatrics. So when they started using them, they immediately had problems with them.” (C)

Limitations of health service capacity

Important limitations in the health service were identified by several interviewees, including a lack of maintenance capacity, staff shortages and poor attitudes towards equipment.

“So we asked [for] them to [be] taken to the Maintenance Department. That’s the common thing which we have with working materials here, like these machines: they develop a problem, you take them to Maintenance for servicing, and that’s where they’ll die!” (F)

“... [C]learly an issue when considering the whole problem of maintenance of equipment in the health service ... is the loss of expertise, the loss of staff.” (E)

“... [T]he pervasive culture of ‘keep it running until it breaks down, then request a new one’.” (A)

Issues with donations

Those interviewed expressed both positive and negative views about this particular donation and about donations in general. Donations were considered

desirable, even necessary, and often well meaning. Nevertheless problems arose from a lack of forethought and consultation, power inequalities between donor and recipient, and with perceived “dumping” of obsolete equipment.

“... I was happy because ... [the donation would] reduce the cost of oxygen in RVTH.” (H)

“It was a good intention but ... I was really disappointed (that the donation failed).” (B)

“And you do get the impression sometimes that the intention is good, but inadequate attention has been paid to the follow-on issues. ... [Y]ou tend to find that what you’re getting are the discards, are the rejects.” (G)

“We are a poor country, we need donations. And we cannot give conditions, that ... you have to do this, you have to do a manual.” (C)

Several interviewees commented on steps that could be taken or had been taken to enhance the effectiveness of donations in the future, noting the need for proactivity and sound process.

“I think that you must have a more proactive stance towards donations ... to ensure that each donation is effective.” (G)

“...I understand... that they have set up a donations committee at RVTH, which I think is a very sound move.” (E)

Technical assessment of the oxygen concentrators

The technical review of the units confirmed that the key problem was that the units were electrically incompatible with the Gambian power supply, requiring 110 Volts and 60 Hz, rather than 220 Volts and 50 Hz, a problem that is not solvable with the use of a step-down transformer. There was evidence that the concentrators were second-hand units that had been serviced before being despatched.

Subsequent to this episode the senior management of the hospital, led by the deputy chief medical director, put into place a donations committee to review future equipment gifts. Through partnership with Voluntary Service

Fig. 1. The donated oxygen concentrators



Overseas, a British nongovernmental organization (NGO), a biomedical engineer joined the staff of RVTH. Oxygen continued to be supplied by cylinders, at considerable expense. The use of appropriate new oxygen concentrators is being considered by management.

Discussion

The donation of equipment to hospitals in resource-poor countries can significantly benefit services in these settings. Without care, however, donations are prone to fail, as occurred in this instance. The immediate reason for the failure in this case was a simple technical one. Even with a step-down voltage transformer the frequency difference meant the units never would have functioned adequately and in fact would be expected to malfunction in just the way described by several informants. While there was clearly goodwill on both sides, it is also clear that neither the donors nor the recipients had the expertise to fully recognize the problem and alter the

outcome. That expertise, preferably on both sides, is necessary to make equipment donations work.

The problem with medical equipment donations in Africa is multifactorial, however, and the lessons go beyond narrow technical considerations. Recipients and donors need to make certain that donations will actually enhance capacity in the recipient health service by actively managing the process. Without this there tends to be a continuing cycle of ineffective solutions to ever-pressing needs, with an associated human cost. This cycle consumes time, energy, money and morale in a health service.

In addition to technical expertise and a proactive approach, successful interventions will require local ownership and participation, and often partners with relevant skills and resources. While donors are crucial participants in the process, so are policy-makers and end users such as clinicians, nurses and maintenance staff, and indeed the public, whose levels of expectations of

public services help shape those services. The formation of a donations committee at RVTH is evidence of a lesson learnt. So too is the strengthening of biomedical engineering expertise through an established partnership with a relevant NGO.

This is just one case, but it is not the exception. During the preparation of this manuscript one of the authors (DP) saw an identical instance in a Papua New Guinean hospital. It is estimated that up to 70% of equipment in sub-Saharan Africa gathers dust for the same reasons that these concentrators did, and that at least half of all medical equipment in the developing world is unusable.^{5,6} Donations are a well-established method for donors to dispose of old equipment, while on the recipients' side donations have strong appeal as ready solutions to gaps in services.⁷ Unfortunately, they can be a poor substitute for the appropriate technologies and genuinely sustainable development so badly needed in the developing world.⁸

Concerns about the scale of unusable equipment in developing countries should not prevent the widespread use of appropriate technology in these settings. Oxygen concentrators have been used with success in developing countries and appear to have important advantages over conventional cylinder-supplied oxygen, not least in terms of cost.⁹⁻¹¹ The concentrators in this report did not meet WHO specifications for this technology, but there are models currently available that do.¹² The maintenance required for appropriate units, such as the changing of air filters, is simple but should be done regularly to maintain adequate function.

This case contained lessons concerning donations of medical equipment and it prompted important changes to hospital policy and capacity. The long-term benefit of these changes is yet to be assessed. A functional donations

management mechanism with a high proportion of successful donations will be the mark of success for these changes. Concerning oxygen treatment for patients, local stakeholders have been engaged to help develop locally relevant solutions to the challenge of ensuring adequate supplies in RVTH and other health-care settings in the Gambia.

While researching this subject the authors found guidelines for medical equipment donations produced by WHO in 2000.⁵ They identify four principles of "good donation practice": the ensuring of maximum benefit to the recipient, respect for the wishes and context of the recipient, the avoidance of quality double standards, and effective donor-recipient communication and planning. This case bears out the importance of these principles and the necessity for putting into practice guide-

lines that appear to have been largely overlooked. The need to strengthen health systems throughout the world is a recognized key to achieving the Millennium Development Goals.¹³ This case is illustrative of this challenge and offers support for WHO policy, and indeed support for the contention that the progression from knowledge and policy to practice is the great challenge of international health. ■

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Résumé

Au-delà des bonnes intentions : leçons tirées d'un don d'équipements à un hôpital africain

Objectif En 2000, un hôpital spécialisé de Gambie a accepté un don de concentrateurs d'oxygène destiné à l'aider à maintenir ses approvisionnements en oxygène. Ces concentrateurs sont tombés en panne et ont été ensuite entreposés. On a alors réalisé une étude de cas pour trouver les raisons de ce problème et en tirer des leçons en vue d'un meilleur approvisionnement en oxygène et d'un plus grand succès des dons d'équipements futurs.

Méthodes Une évaluation technique des concentrateurs a été réalisée par un ingénieur biomédical disposant des compétences nécessaires. Des entretiens semi-structurés ont été menés avec des informateurs clés, suivis d'une analyse de leur contenu et de l'application d'une démarche inductive visant à reconstituer l'histoire de l'épisode et les raisons de son échec.

Résultats Les entretiens ont confirmé l'importance des problèmes techniques affectant les équipements. Ils ont aussi révélé que le processus de don avait été mal organisé et que l'hôpital ne disposait pas des compétences nécessaires pour évaluer et entretenir ces équipements. L'évaluation technique a aussi

montré qu'aucune des unités hospitalières n'avait la tension et la fréquence de réseau voulues, d'où des surchauffes et des pannes. Par la suite, un comité sur les dons a été mis en place au sein de l'hôpital pour surveiller les processus de donation. Des compétences en ingénierie biomédicale ont été mises en place dans l'hôpital par une organisation non gouvernementale (ONG).

Conclusion Des dons appropriés d'équipements, et notamment de concentrateurs d'oxygène, peuvent être très utiles aux hôpitaux des pays à faible revenu, mais les destinataires et les donateurs doivent gérer activement ces opérations pour s'assurer qu'elles soient bénéfiques. Pour réussir, ces opérations nécessitent une planification, des compétences techniques et une participation locale. On peut également avoir besoin de partenaires apportant des compétences et des ressources appropriées. En 2002, l'OMS a élaboré des recommandations à propos des dons d'équipements médicaux, qui traitent des problèmes pouvant se présenter. Ces recommandations doivent être publiées et utilisées.

Resumen

Las buenas intenciones no bastan: lecciones de un hospital africano sobre las donaciones de equipo

Objetivo En 2000, un hospital de referencia de Gambia aceptó una donación de concentradores de oxígeno para poder garantizar mejor el suministro de oxígeno, pero los aparatos se averiaron y tuvieron que ser almacenados. Se realizó un estudio de casos para determinar las razones del problema y extraer lecciones a fin de ayudar a mejorar tanto el suministro de oxígeno como la eficacia de las futuras donaciones de equipo.

Métodos Un ingeniero biomédico dotado de los conocimientos técnicos pertinentes realizó una evaluación técnica de los concentradores. Se llevaron a cabo entrevistas semiestructuradas con informantes clave, y se aplicaron técnicas de análisis del

contenido y enfoques inductivos para reconstruir la historia del episodio y las razones del fracaso.

Resultados Las entrevistas confirmaron la importancia de los problemas técnicos que presentaba el equipo, pero también revelaron que había habido fallos en el proceso de donación y que el hospital carecía de los conocimientos técnicos necesarios para evaluar y mantener el equipo. La evaluación técnica mostró que en todas las unidades el voltaje y la frecuencia habían sido incorrectos, con el consiguiente recalentamiento y avería de los aparatos. Posteriormente se estableció un comité de donaciones hospitalarias para supervisar el proceso de las donaciones, y se

organizó un sistema de asesoramiento especializado de ingeniería biomédica in situ con una organización no gubernamental (ONG) asociada.

Conclusión Las donaciones de equipo médico, incluidos los concentradores de oxígeno, pueden ser una opción muy útil para los hospitales de los entornos con recursos escasos, pero tanto los beneficiarios como los donantes han de saber gestionar

activamente las donaciones para garantizar que sean provechosas, y eso exige planificación, conocimientos especializados y participación local. A veces se necesitan también asociados que posean las aptitudes y los recursos oportunos. En 2002 la OMS elaboró unas directrices para la donación de equipo médico, en las que se abordan los problemas que pueden plantearse. Dichas directrices deberían ser divulgadas y utilizadas.

ملخص

ما بعد النية الطيبة: الدروس المستفادة من التبرع بأجهزة لمستشفى أفريقي

وحدات الأجهزة كانت ذات تردد وفولت غير مناسبين، مما أدى إلى ارتفاع درجة حرارتها وتعطلها. وقد أنشئت في أعقاب ذلك لجنة في المستشفى، معنية بالإشراف على عملية تقديم التبرعات. وتم توفير الخبرة المناسبة في مجال الهندسة البيولوجية والطبية بالتعاون مع منظمة غير حكومية شريكة. **الاستنتاج:** يمكن للأجهزة الطبية المناسبة المقدمة كتبرعات، بما في ذلك أجهزة تكييف الأكسجين، أن تفيد المستشفيات الموجودة في الأماكن الفقيرة الموارد، ولكن ينبغي أن يتولى مقدمو الأجهزة وملتقوها إدارة شؤون هذه التبرعات بعناية، لضمان الاستفادة المناسبة منها. فالنجاح يتطلب تخطيطاً، وخبرة تقنية، ومشاركة محلية. وقد يحتاج الأمر أيضاً إلى شركاء لديهم موارد ومهارات مناسبة. وكانت منظمة الصحة العالمية قد أصدرت في عام 2002 دلائل إرشادية حول التبرع بالأجهزة الطبية، تتناول المشكلات التي تواجه الأجهزة، وهي دلائل ينبغي التعريف بها والدعوة إلى استخدامها.

الهدف: تلقى مستشفى للإحالة في غامبيا، في عام 2000، تبرعاً بأجهزة لتكييف الأكسجين، بغرض تأمين إمدادات كافية منه. غير أن الأجهزة تعطلت ونُقلت إلى المخازن. وقد أجريت دراسة حالة للوقوف على أسباب المشكلة واستخلاص الدروس منها، للمساعدة على تحسين إمدادات الأكسجين وضمان نجاح التبرعات المقدمة مستقبلاً. **الطريقة:** أجري تقييم تقني للأجهزة من قبل مهندس مختص بالأجهزة البيولوجية والطبية ولديه خبرة مناسبة بها. وتم تنظيم مقابلات شبه تفصيلية مع مقدمي المعلومات الرئيسيين، مع تحليل محتواها وتطبيق الأساليب الاستقرائية لمعرفة تاريخ الأجهزة وأسباب تعطلها. **الموجودات:** أكدت المقابلات أهمية المشكلات التقنية التي تتعرض لها الأجهزة. كما كشفت المقابلات عن وجود عيوب بها، وعن افتقار المستشفى للخبرة اللازمة لتقييم الأجهزة أو صيانتها. وبيّن التقييم التقني أن جميع

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