

question surrounds the issue of how patients are selected. Electrocardiography, conventionally used to detect left bundle branch block and therefore presumed ventricular dyssynchrony, has been shown to be a poor predictor of patients' response.<sup>7</sup> Up to 30% of patients who receive an implant do not respond.<sup>8</sup> Electrocardiography will probably be surpassed by more sensitive echocardiographic techniques, such as tissue Doppler imaging,<sup>9</sup> which permit accurate quantification of regional ventricular contraction. Biventricular pacing has a small but important risk in this sick population, and better selection of patients and identification of individuals who will benefit is essential to achieve maximal therapeutic advantage safely. Further, placement of the left ventricular lead in the coronary venous system is technically challenging and has an important failure rate using available technology.<sup>3</sup>

In considering devices for heart failure, the growing weight of evidence for biventricular pacing needs to be considered alongside the expanding indications for implantable cardioverter defibrillators.<sup>10</sup> Implantable cardioverter defibrillators with biventricular pacing capabilities exist, and their use in some patients with existing (or even predicted) asynchrony may improve symptoms and prevent possible exacerbations of heart failure. Early evidence indicates that biventricular pacing reduces the number of implantable cardioverter defibrillation treatments required.<sup>11</sup> A growing overlap between groups of patients for whom implantable cardioverter defibrillation and biventricular pacing are indicated will probably result in the implantation of devices with combined capability in a subset of patients in the future.

With each new study that adds to the evidence base for device therapy for left ventricular dysfunction, the financial implications seem ever greater, but the issue of cost effectiveness remains contentious and warrants further examination when longer term outcome data are available. Whatever the eventual outcome of such studies, the key to effective device therapy in heart failure must lie in careful selection of patients. Although device therapy for heart failure is likely to remain an

appropriate adjunct to optimal medical treatment and revascularisation, cost will probably be the limiting factor in determining how widespread the use of such devices will become.

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- Grines CL, Bashore TM, Boudoulas H, Olson S, Shafer P, Wooley CF. Functional abnormalities in isolated left bundle branch block. The effect of interventricular asynchrony. *Circulation* 1989;79:845-53.
- Abraham WT, Fisher WG, Smith AL, Delurgio DB, Leon AR, Loh E, et al. Cardiac resynchronization in chronic heart failure. *N Engl J Med* 2002;346:1845-53.
- Daubert JC, Ritter P, Le Breton H, Gras D, Leclercq C, Lazarus A, et al. Permanent left ventricular pacing with transvenous leads inserted into the coronary veins. *Pacing Clin Electrophysiol* 1998;21(suppl 1, pt 2):239-45.
- Cazeau S, Leclercq C, Lavergne T, Walker S, Varma C, Linde C, et al. Effects of multisite biventricular pacing in patients with heart failure and intraventricular conduction delay. *N Engl J Med* 2001;344:873-80.
- Bristow MR, Feldman AM, Saxon LA. Heart failure management using implantable devices for ventricular resynchronization: Comparison of medical therapy, pacing, and defibrillation in chronic heart failure (COMPANION) trial. COMPANION Steering Committee and COMPANION Clinical Investigators. *J Card Fail* 2000;6:276-85.
- Cleland JG, Daubert JC, Erdmann E, Freemantle N, Gras D, Kappenberger L, et al. The CARE-HF study (cardiac resynchronization in heart failure study): rationale, design and end-points. *Eur J Heart Fail* 2001;3:481-9.
- Nelson GS, Curry CW, Wyman BT, Kramer A, Declercq J, Talbot M, et al. Predictors of systolic augmentation from left ventricular preexcitation in patients with dilated cardiomyopathy and intraventricular conduction delay. *Circulation* 2000;101:2703-9.
- Reuter S, Garrigue S, Barold SS, Jais P, Hocini M, Haissaguerre M, et al. Comparison of characteristics in responders versus nonresponders with biventricular pacing for drug-resistant congestive heart failure. *Am J Cardiol* 2002;89:346-50.
- Ansalone G, Giannantoni P, Ricci R, Trambaiolo P, Laurenti A, Fedele F, et al. Doppler myocardial imaging in patients with heart failure receiving biventricular pacing treatment. *Am Heart J* 2001;142:881-96.
- Moss AJ, Zareba W, Hall WJ, Klein H, Wilber DJ, Cannom DS, et al. Prophylactic implantation of a defibrillator in patients with myocardial infarction and reduced ejection fraction. *N Engl J Med* 2002;346:877-83.
- Higgins SL, Yong P, Sheck D, McDaniel M, Bollinger F, Vadecha M, et al. Biventricular pacing diminishes the need for implantable cardioverter defibrillator therapy. Ventak CHF Investigators. *J Am Coll Cardiol* 2000;36:824-7.

## Scientific literature's open sesame?

*Charging authors to publish could provide free access for all*

**H**ow could you make the results of the world's original biomedical research freely available to anyone who wanted them? This question remained hypothetical until the arrival of the world wide web, which allows distribution of material at only a fraction of the cost of distribution on paper. But publishing peer reviewed original research has some costs that the internet cannot magic away. Recently, a way to meet those costs has become clear. The goal of original research being free to everybody everywhere could be very close.

Currently subscribers to journals, mostly academic libraries, pay for access to scientific information. In the new model, authors (or, more likely, those who employ them or fund their research) would pay the costs of peer reviewing and electronically disseminating their articles. This one off processing charge would ensure

that the article was freely available to all, forever. Journals' estimates of how much this article processing charge would need to be to cover their costs vary between \$500 (£314) and \$1800 per article.<sup>1</sup> In disciplines where authors already pay submission and page charges the change would be small.

Experiments with the "author pays" model are already under way. Over the past two years, the publisher BioMed Central has set up 90 electronic journals adopting this model. The two new journals planned by the Public Library of Science (a pressure group set up to promote open access to the world's primary research literature) will be funded this way, and several existing journals are likely to begin experiments over the next year.<sup>2</sup> In these experiments peer review would occur exactly as it does now—the author pays model would not become a form of vanity publishing.

While authors and readers have most to gain from this change, it's the funders of research that could do most to bring it about. Under the current access model, the result of hundreds of thousands of pounds of research funding may be seen by only a small fraction of the intended audience, because it is published in journals that few institutions can afford to subscribe to. For example, an annual subscription to *Brain Research* costs \$20 000. Poor distribution limits the possibility that research could change practice—of increasing concern to funders.

This could be remedied if funding bodies earmarked just a few per cent of their research grants to cover article processing charges, recognising the costs of dissemination as a legitimate component of the total costs of research. The point hasn't been lost on some of the world's biggest research funding agencies, which have signed up to an institutional membership programme at BioMed Central. Payment of a membership fee waives article processing charges for staff. Last month the NHS in England joined a list of members that included the US National Institutes of Health, the World Health Organization, France's Institut National de la Santé et de la Recherche Médicale (INSERM), and Cancer Research UK.<sup>3</sup> The NHS's decision is consistent with a Department of Health report stating that research and development findings should be readily available, open to critical examination, and accessible to healthcare professionals, patients, carers and the wider public.<sup>4</sup> Funders could go one step further and make open access publication a condition of funding.

Even if this switch from paying for access to paying for dissemination resulted in no financial savings within scientific publishing, it would be worth doing, as the end result would be availability to all, instead of only to those who can afford subscriptions. But charging for article processing makes the costs transparent, and once users can take price into account in decisions about where to submit, the prices should fall. A genuine market could develop among suppliers, competing on more than just impact factors—for example, speed and quality of peer review.

The biggest obstacle to change is therefore likely to be the scientific and medical publishers—the fastest growing subsector of the media industry and now worth \$7bn a year. While its market leader, Elsevier, generates annual profits of £290m with margins of nearly 40% on its core journal business,<sup>5,6</sup> many publishers achieve profit margins of at least half this. “Not for profit” publishers have also been cashing in on this bonanza, becoming cash cows for the scientific societies that own them. William Arms, professor of computer science at Cornell University, likens these arrangements to “gentlemen's clubs living off their bar profits.” Societies now have a dilemma: moving to the author pays model reduces their profits and the possibility of subsidising other good works, but it furthers the dissemination of knowledge in the area of science that they foster and promote (the reason they originally embarked on their scientific publishing programmes).<sup>7</sup>

Surprisingly, another obstacle to the acceptance of the new model is likely to be academic institutions. While sharing the funding agencies' goal of achieving the widest possible dissemination of research findings, their reliance on journal impact factors as a surrogate for the quality of research protects the status quo. It gives

no incentive for high impact factor journals to reconsider their publishing model and discourages staff from submitting research to journals that have adopted the new model but which have low impact factors.

None of the supporters of the new model believes that transition will be easy. One way of arriving there in stages has been proposed by David Prosser, based on the model adopted by several entomology journals. Authors are presented with two options: either to pay the processing charge that makes the article available to all or not to pay the processing charge, which leaves the article available only to subscribers. The result would be a hybrid online journal in which access would be dependent on authors' willingness to pay.<sup>8</sup>

Further tweaks can be envisaged. While current experiments charge only for accepted articles, a schedule of charges could be drawn up—starting with a small submission fee and scaling up for increasingly detailed feedback. Charging for submission would mean that the authors of accepted papers would not be subsidising the costs arising from rejected papers. Once an article is accepted for publication, its technical editing could be an optional extra that authors pay for. Decisions about readability would therefore rest with authors. A consensus is already emerging that processing charges will be waived in cases of financial hardship—for example, for researchers from developing countries.

Two years ago, we wrote of “an Aladdin's cave of ideas” in connection with PubMed Central, another initiative to free up the world's biomedical literature.<sup>9</sup> Since then, we've continued to make the full contents of the *BMJ* freely available from [bmj.com](http://bmj.com) and our original research articles freely available from PubMed Central (one of few “traditional” journals to do so). We've made the full contents of the BMJ Publishing Group's specialist journals freely available to people in the developing world and we've helped WHO to broker a similar arrangement with the world's largest scientific publishers.<sup>10</sup> But most of the world's original biomedical research remains out of reach to most people who could use it. Widespread acceptance of an author pays model could be scientific publishing's open sesame moment.

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- 1 Doyle M. Changing the model and surviving. [www.alp.org/2003ppts/day040403.ppt](http://www.alp.org/2003ppts/day040403.ppt) (accessed 23 Apr 2003).
- 2 Delamothe T. “Author pays” may be the new science publishing model. *BMJ* 2003;326:182.
- 3 White C. Deal brokered for free online access to NHS research. *BMJ* 2003;326:568.
- 4 Department of Health. Research and development for a first class service: R&D findings in the new NHS. London: DoH, 2000. [www.doh.gov.uk/research/documents/rd3/first\\_class\\_service.pdf](http://www.doh.gov.uk/research/documents/rd3/first_class_service.pdf) (accessed 23 Apr 2003)
- 5 Reed Elsevier: subscription revenue credited for bolstering net profit 43% *Wall Street Journal* 21 February 2003 <http://wsj.com>
- 6 Gooden P, Owen M, Simon S, Singlehurst L. *Scientific publishing: knowledge is power*. [www.econ.ucsb.edu/~tedb/Journals/morganstanley.pdf](http://www.econ.ucsb.edu/~tedb/Journals/morganstanley.pdf) (accessed 23 Apr 2003).
- 7 Velterop J. Should scholarly societies embrace open access (or is it the kiss of death)? *Learned Publishing* (in press).
- 8 Prosser D. SPARC Europe on open access. *UKSG Serials-eNews*. [www.biblio-tech.com/UKSG/SI\\_PD.cfm?AC=2160&PID=10&ZID=623](http://www.biblio-tech.com/UKSG/SI_PD.cfm?AC=2160&PID=10&ZID=623) (accessed 23 April 2003).
- 9 Delamothe T, Smith R. PubMed Central: creating an Aladdin's cave of ideas. *BMJ* 2001;322:1-2.
- 10 Smith R. Closing the digital divide. *BMJ* 2003;326:238.