Perhaps once every generation, a miracle cure emerges. The effect size is so dramatic as to obviate the need for clinical trials as the difference between the treated and untreated patient is apparent even to the casual observer. Antibiotics were called wonder drugs when they were first introduced because their efficacy was obvious even at the single patient level. However, a century before penicillin, a medical therapy was introduced whose effect on patients was even more dramatic and much more rapid. This therapy was said to ‘reanimate the dead’ and to this day, it is so inextricably linked to the practice of critical care, anaesthesiology, and perioperative medicine that few would have the courage to challenge it. The treatment to which we refer is of course i.v. fluid therapy.

The first use of saline for i.v. fluid resuscitation is usually attributed to William O’Shaughnessy,1 a (then) recent graduate of Edinburgh University Medical School. In 1831, London was in the midst of a cholera epidemic that would eventually claim some 23 000 lives. Having been unimpressed with the effectiveness of the standard treatment of the time (consisting primarily of blood letting), O’Shaughnessy performed a chemical analysis of the blood of patients and concluded that a deficiency of water and ‘normal salts’ was the proximal cause of death. He recommended a dilute salt solution and administered it to dogs without any apparent harm. Reading his account in the Lancet, Dr Thomas Latta of Leith acknowledged and applied O’Shaughnessy’s treatment to patients, with remarkable success. However, the composition of fluid used was decidedly more complex than simple saline, having been made to approximate normal blood plasma, though diluted to replace lost water. Indeed, the solution, if anything, approximated 0.45% saline with some sodium bicarbonate.2 Nevertheless, medicine’s love affair with salt water can be traced to these early successes in resuscitated cholera victims.

Synthesizing data in the modern era

Beyond the question of when and how much fluid should be given is the question of whether it is the general type of fluid (crystalloid or colloid) or the precise composition of that fluid that matters. Although standardization of medical practice offers the potential to save lives and money,3,4 in practice, realizing this worthy goal is often difficult. Generating high-level, reliable scientific evidence as to which approach is better, using large blinded randomized controlled clinical trials (RCTs), is time-consuming and costly, and most practices in medicine do not enjoy this kind of evidence base. Furthermore, medical practice does not occur in a vacuum; there is wide variation not only from one physician to the next but also among hospitals, across entire healthcare delivery systems and especially between different countries. Thus, attempts at standardization inevitably involve evaluation of the available evidence that by necessity cannot be restricted to the published RCTs, but that must also include observational studies and even expert opinion. Synthesis and evaluation of this evidence necessitates a certain degree of subjectivity and introduces the potential for bias. For these reasons, our methodology involves the use of content experts from a number of different
ADQI methodology

The specific methods for ADQI conferences have been developed and refined over several years and have been reported in detail elsewhere. Briefly, our methods comprise (i) a systematic search for evidence with review and evaluation of the available literature; (ii) the establishment of clinical and physiological outcomes and also measures to be used for comparison of different treatments; (iii) the description of current practice and the rationale for the use of current techniques; and (iv) the analysis of areas in which evidence is lacking and future research is required to obtain new information. The topics chosen for each conference are selected on the basis of the following criteria: (i) prevalence of the clinical problem; (ii) estimate of variation in clinical practice; (iii) potential influence on outcome; (iv) potential for development of evidence-based guidelines; and (v) availability of scientific evidence.

The activities for each ADQI conference are divided into three phases: pre-conference, conference, and post-conference. In the pre-conference phase, the topics are selected and the work groups are assembled and assigned to specific topics. Each group identifies a list of key questions, conducts a systematic literature search, and generates a bibliography of key studies. Studies are identified via Medline search, bibliographies of review articles, and participants’ files. Searches are generally limited to English-language articles. However, articles written in other languages are used when identified and presented by members of the group.

The next step, the conference itself, is divided into breakout sessions, where work groups address the issues in their assigned topic area, and plenary sessions, where the findings and deliberations are presented, debated, and refined. Each work group is composed of four to six members. Conference directors circulate between the breakout groups and also serve as facilitators and moderators for plenary sessions. Evidence is classified according to the Grades of Recommendation Assessment, Development and Evaluation (GRADE) system where possible. Animal research is not considered clinical evidence, but its use, particularly in the absence of clinical data, is permissible and even encouraged if it directly addresses the questions posed.

A series of summary statements are then developed through a series of breakout sessions where individual work group members are required to (i) identify key issues for which recommendations are needed; (ii) classify the current state of consensus, and (iii) identify supporting evidence for each issue (see Appendix). Work group members are then required to present their findings to the entire group, revising each statement as needed until a final version is agreed upon. The responsibility for presenting the findings of the work group to the rest of the participants is typically shared by each member on a rotating basis. Group facilitators revise work group findings as needed after each plenary session. Directives for future research are also sought and when possible, pertinent study design issues are also considered. Finally, a writing committee assembles the individual reports from the work groups. Each report is edited to conform to a uniform style and for length. The final reports are then circulated to each participant for comment and revision.

It is our belief that the five papers in this series, in this and the coming issues of the BJA, provide a valuable distillation of the current state of the art of i.v. fluid administration and removal in the context of perioperative and critical care medicine. We have attempted to identify consensus where it exists, to make recommendations where we believe it is helpful to do so, and to provide a balanced discussion of the more controversial issues where they crop up. Each pair of papers is accompanied by a commentary written by an acknowledged expert who did not attend the conference in person, in order to gain further independent perspective from an individual with deep knowledge of the field.

Supplementary material

Supplementary material is available at British Journal of Anaesthesia online.

Acknowledgements

We would like to extend our sincere thanks to Siobhan Mythen for her expert assistance with meeting logistics.

Declaration of interest

M.G.M. is a BJA board member, and A.D.S. is an associate editorial board member.

Funding

ADQI XII was funded by unrestricted educational grants from Astute Medical Inc, Baxter Healthcare Corporation, Edwards.
Inc, FAST Biomedical Inc, Fresenius Kabi, Gambro Inc, Grifols Inc, LIDCO Ltd and NxStage Inc.

References


Appendix: ADQI XII Investigators listed by working group

ADQI XII CO-CHAIRS

Andrew D Shaw, Department of Anesthesiology, Vanderbilt University Medical Center, Nashville, TN, USA. John A Kellum, Center for Critical Care Nephrology, Department of Critical Care Medicine, University of Pittsburgh School of Medicine, Pittsburgh, PA. Michael (Monty) G Mythen, Department of Anaesthesia, University College London, London, UK.

Group A

Lakshmi S. Chowla, Department of Anaesthesiology and Critical Care Medicine, George Washington University Medical Center, Washington, DC, USA; Can Inc, Department of Intensive Care, Erasmus MC University Hospital Rotterdam, Rotterdam, The Netherlands; Daniel Chappell, Department of Anaesthesiology, University Hospital of Munich, Munich, Germany; Tong J. Gan, Department of Anaesthesiology, Duke University Medical Center, Durham, NC, USA.

Group B

Karthik Raghunathan, Department of Anaesthesiology, Duke University Medical Center/Durham VAMC, Durham, NC, USA; Patrick T. Murray, School of Medicine and Medical Science, University College Dublin, Dublin, Ireland; W. Scott Beattie, Department of Anaesthesia and Pain Management, Toronto General Hospital, Toronto, ON, Canada; Dileep N. Lobo, Division of Gastrointestinal Surgery, Nottingham Digestive Disease Centre National Institute of Health Research Biomedical Research Unit, Nottingham University Hospitals, Queen’s Medical Centre, Nottingham NG7 2UH, UK; John Myburgh, Department of Intensive Care Medicine, St George Hospital, Sydney, The George Institute for Global Health, Australia; Robert Sladen, Department of Anaesthesiology, Columbia University Medical Center, New York, NY, USA.

Group C

Eric A. Hoste, Department of Intensive Care Medicine, Ghent University Hospital, Ghent University, Ghent, Belgium; Kathryn Maitland, Wellcome Trust Centre for Clinical Tropical Medicine, Department of Paediatrics, Faculty of Medicine, Imperial College, London, UK; Charles S. Brudney, Department of Anaesthesiology, Duke University Medical Center/Durham VAMC, Durham, NC, USA; Ravindra Mehta, Division of Nephrology and Hypertension, Department of Medicine, University of California, San Diego, San Diego, CA, USA; Jean-Louis Vincent, Department of Intensive Care, Erasme University Hospital, Université Libre de Bruxelles, Brussels, Belgium; David Yates, Department of Anaesthesia, York Teaching Hospital NHS Foundation Trust, York, UK.

Group D

Stuart L. Goldstein, Center for Acute Care Nephrology, Nephrology and Hypertension, The Heart Institute, Cincinnati Children’s Hospital Medical Center, 3333 Burnet Avenue, NLC 7022 RILF2, Cincinnati, OH 45229, USA; Sean M. Bagshaw, Division of Critical Care Medicine, Faculty of Medicine and Dentistry, University of Alberta, 3C1.12 Walter C. Mackenzie Centre, 8440-112 ST NW Edmonton, Canada T6G 2B7; Maurizio Cecconi, Anaesthesia and Intensive Care Medicine, St George’s Hospital and Medical School, London SW17 0QT, UK; Mark D. Okusa, Division of Nephrology, University of Virginia Health System, Charlottesville, VA, USA; Henry E. Wang, Department of Emergency Medicine, University of Alabama School of Medicine, Birmingham, AL, USA.

Group E

Mitchell H. Rosner, Division of Nephrology, University of Virginia Health System, Charlottesville, VA, USA; Marlies Ostermann, Department of Critical Care, King’s College London, King’s Health Partners, Guy’s & St Thomas’ Foundation Hospital, London, UK; Raghavan Murugan, Department of Critical Care Medicine, University of Pittsburgh School of Medicine, Pittsburgh, PA, USA; John R. Prowle, Adult Critical Care Unit, The Royal London Hospital, Barts Health NHS Trust, London, UK; Claudio Ronco, Department of Nephrology, Dialysis and Transplantation, International Renal Research Institute (IRRIV), San Bortolo Hospital, Vicenza, Italy.