ANZJP

Australian & New Zealand Journal of Psychiatry
1–15
DOI: 10.1177/0004867419839139

Royal Australian and New Zealand College of Psychiatrists professional practice guidelines for the administration of electroconvulsive therapy

Alan Weiss[1], Salam Hussain[2,3], Bradley Ng[4], Shanthi Sarma[5], John Tiller[6,7], Susan Waite[8,9] and Colleen Loo[10,11]

The Royal Australian & New Zealand College of Psychiatrists

Abstract

Objectives: To provide guidance for the optimal administration of electroconvulsive therapy, in particular maintaining the high efficacy of electroconvulsive therapy while minimising cognitive side-effects, based on scientific evidence and supplemented by expert clinical consensus.

Methods: Articles and information were sourced from existing guidelines and the published literature. Information was revised and discussed by members of the working group of the Royal Australian and New Zealand College of Psychiatrists' Section for Electroconvulsive Therapy and Neurostimulation, and findings were then formulated into consensus-based recommendations and guidance. The guidelines were subjected to rigorous successive consultation and external review within the Royal Australian and New Zealand College of Psychiatrists, involving the full Section for Electroconvulsive Therapy and Neurostimulation membership, and expert and clinical advisors and professional bodies with an interest in electroconvulsive therapy administration.

Results: The Royal Australian and New Zealand College of Psychiatrists' professional practice guidelines for the administration of electroconvulsive therapy provide up-to-date advice regarding the use of electroconvulsive therapy in clinical practice and are informed by evidence and clinical experience. The guidelines are intended for use by psychiatrists and also others with an interest in the administration of electroconvulsive therapy. The guidelines are not intended as a directive about clinical practice or instructions as to what must be done for a given patient, but provide guidance to facilitate best practice to help optimise outcomes for patients. The outcome is guidelines that strive to find the appropriate balance between promoting best evidence-based practice and acknowledging that electroconvulsive therapy is a continually evolving practice.

Conclusion: The guidelines provide up-to-date advice for psychiatrists to promote optimal standards of electroconvulsive therapy practice.

Keywords

Guidelines, electroconvulsive therapy, monitoring, depressive disorders, schizophrenia

[1]School of Medicine and Public Health, Faculty of Health and Medicine, The University of Newcastle, Australia, Callaghan, NSW, Australia
[2]School of Psychiatry, Faculty of Health and Medical Sciences, The University of Western Australia, Perth, WA, Australia
[3]Sir Charles Gairdner Hospital Mental Health Service, Perth, WA, Australia
[4]Mental Health and Specialist Services, Robina Hospital, Robina, QLD, Australia
[5]Mental Health and Specialist Services, Gold Coast Hospital and Health Service, Southport, QLD, Australia
[6]Department of Psychiatry, The University of Melbourne, Melbourne, VIC, Australia
[7]Professorial Psychiatry Unit, Albert Road Clinic, Melbourne, VIC, Australia
[8]Department of Mental Health Services, The Queen Elizabeth Hospital, Adelaide, SA, Australia
[9]Discipline of Psychiatry, The University of Adelaide, Adelaide, SA, Australia
[10]School of Psychiatry, UNSW Sydney, Sydney, NSW, Australia
[11]Sydney Neurostimulation Centre, Black Dog Institute, Randwick, NSW, Australia

Corresponding author:
Alan Weiss, School of Medicine and Public Health, Faculty of Health and Medicine, The University of Newcastle, Australia, University Drive, Callaghan, NSW 2308, Australia.
Email: a.weiss@hssc.com.au

Introduction

Overview

The Royal Australian and New Zealand College of Psychiatrists' (RANZCP) Section of Electroconvulsive Therapy and Neurostimulation (SEN) is mindful that effective use of electroconvulsive therapy (ECT) involves the art of applying clinical knowledge and skills to the individual needs of patients. ECT practice requires specialised knowledge and expertise, and there is variation in practice, particularly in regard to electrode placement, pulse width and dosing. ECT is an appropriate and effective treatment for a number of psychiatric indications; however, variation in practice can lead to very different outcomes, including rates of cognitive side-effects and clinical outcomes (Gálvez et al., 2016; Sackeim et al., 2007). Development of specific advice in regard to ECT practice was deemed by the RANZCP to be important to promote more consistency in practice and clinical outcomes.

Methodology

In scoping the development of the guidelines, the primary focus was to look at ways to minimise cognitive side-effects while maintaining the high efficacy of ECT, particularly in regard to electrode placement and pulse width. The scope of the document was subject to discussion at the SEN members' forum in August 2016, where members agreed that guidelines of this nature would be appropriate. Draft guidelines were subsequently developed by a working group appointed by the SEN Executive Committee, taking feedback from the SEN members' forum into account. Articles and information were sourced from existing guidelines, for example, the RANZCP Clinical Practice Guidelines for mood disorders and for the management of schizophrenia and related disorders. These were supplemented by reference to key studies in the literature. No formal literature search methodology was used. Literature was sourced in regard to specific issues discussed by the working group. Information was revised and discussed by the working group, and findings were then formulated into consensus-based recommendations and guidance.

Feedback on the guidelines was sought in June 2017 from all RANZCP Branch committees and the New Zealand National Committee, as well as relevant RANZCP committees: the Committee for Evidence-Based Practice, the Faculty of Child and Adolescent Psychiatry, Faculty of Old Age Psychiatry, and the Section of Perinatal and Infant Psychiatry. As these committees represent specialised patient groups relevant to the guidelines, their expert recommendations were taken into account. As development of the guidelines progressed, feedback dictated that more comprehensive guidelines covering broader aspects of ECT delivery would be helpful, rather than focusing on minimising adverse cognitive side-effects. Accordingly, the guidelines were revised to provide an overall review of legislation, patient selection, consent, education and training, research and governance, as well as the clinical aspects relevant to ECT administration including electrode placement, pulse width, dosing, medication use, maintenance and continuation ECT, and anaesthesia. However, the overall focus and purpose remained on encouraging practice that minimises adverse effects, including the lowest cognitive impairment, while retaining efficacy. Throughout this process, the draft guidelines were regularly reviewed by the SEN Executive Committee at its bi-monthly meeting.

A final draft version of the guidelines was sent to over 400 members of the SEN in September 2017. This was to ensure in advance of publication the potential usefulness of the guidelines to practice. It was well received by the nine members who responded, and their comprehensive feedback was incorporated into the guidelines. A list of contributors who provided feedback on the guidelines at any stage is listed in Supplemental Appendix 1. The guidelines were further reviewed by the Australian and New Zealand College of Anaesthetists in December 2017, and principles for anaesthetic management were included as a result. The guidelines were approved, in line with RANZCP processes, by the Practice, Policy and Partnerships Committee, the Corporate Governance and Risk Committee, and finally by the RANZCP Board in April 2018.

RANZCP professional practice guidelines for the administration of ECT

Purpose

These professional practice guidelines (PPG) developed by the RANZCP provide guidance on professional practice issues that psychiatrists should consider when administering ECT. The guidelines are not intended as a directive about clinical practice, or instructions as to what must be done for a given patient, but provide guidance to facilitate best practice to help optimise outcomes for patients. It is not a full and complete review of ECT procedure.

One of the main concerns about ECT is the potential for cognitive adverse effects. A fundamental premise of ECT administration should be to maximise benefit but to minimise adverse effects. ECT techniques aimed at recovery that promote the lowest cognitive impairment while retaining efficacy are recommended in these guidelines.

In reading these guidelines, it is important to recognise that the circumstances of each individual differ greatly, and consequently, each patient should be considered separately at their time of presentation and over the course of treatment to ensure that the most appropriate treatment is given to meet each patient's individual needs. The term patient is used through these guidelines for clarity and consistency although it is recognised that individuals may prefer

alternative terms, for example, person, consumer, client or service user.

What is ECT?

ECT is a therapeutic medical procedure for the treatment of severe psychiatric disorders. Its primary purpose is to rapidly relieve psychiatric symptoms. ECT involves the delivery of a small electrical current to the brain sufficient to induce a seizure for therapeutic purposes while the patient is under anaesthetic.

When can ECT be used?

ECT must be performed within legislative requirements as defined in Australian state and territory and New Zealand Mental Health Acts. It is advised that psychiatrists read and familiarise themselves with the relevant requirements for ECT within the jurisdiction in which they practice. The RANZCP has prepared a comparison table of regulation of ECT in Australian and New Zealand Mental Health Acts (RANZCP, 2017a). Further local guidelines are also available, including Chief Psychiatrist's guidelines.

ECT should only be administered for an illness where there is adequate evidence of effectiveness and an appropriate clinical indication. It should be considered as a therapeutic option alongside other treatments after detailed psychiatric assessment. Indications for ECT include the treatment of the following:

- Depressive disorders including major depression and major depression with psychotic features, major depression with melancholic features and major depression with peripartum onset.
- Other psychiatric disorders such as bipolar disorder (manic, mixed and depressed phases), acute and chronic treatment-resistant schizophrenia, schizoaffective disorder, catatonia, acute psychosis, puerperal psychosis and neuroleptic malignant syndrome.

ECT may also have a role in the treatment of severe and repetitive self-injurious behaviours in autism (Ghaziuddin and Walter, 2013), and for the treatment of agitation and aggression in patients with dementia (Glass et al., 2017; Isserles et al., 2017; Manjola, 2015), though should only occur in these circumstances and for other emerging indications in consultation with a psychiatrist with expertise in the use of ECT for such indications. There is also potential application of ECT in the treatment of severe Parkinsonism not responsive to medication with the on–off phenomenon and the occasional use of ECT for intractable temporal lobe epilepsy (Surya et al., 2015).

ECT should be considered for depressed patients who have not responded to adequate trials of medication and psychotherapy. ECT should also be considered when rapid clinical improvement is required. It is potentially a first-line treatment in severe depression when there is inadequate oral intake, a high suicide risk or high levels of patient distress, and also for patients with psychotic depression, acute psychosis, catatonia, delirious mania or previous positive response to ECT (Malhi et al., 2015). ECT is also used as a prophylactic treatment in major depressive disorder, bipolar disorder and schizophrenia through maintenance ECT.

A summary of available evidence of efficacy for ECT and its recommended use is provided in the RANZCP Clinical Practice Guidelines for mood disorders (Malhi et al., 2015) and the RANZCP Clinical Practice Guidelines for the management of schizophrenia and other related disorders (Galletly et al., 2016).

Patient selection

The screening and selection of appropriate patients is essential and should be conducted by a psychiatrist. All psychiatrists should have an understanding of when ECT is clinically indicated and be aware of potential contraindications to treatment. When psychiatrists do not have detailed knowledge of the range of ECT modalities available (including their potential benefits and adverse effects), it is strongly recommended that the psychiatrist seek advice from a psychiatrist with current and appropriate ECT experience to determine the optimal treatment for a given patient. Individual patient factors may include the diagnosis, the urgency with which response is required, and the patient's potential vulnerability to cognitive and physical adverse effects.

There appear to be no differences in the effectiveness and safety of ECT in adolescents, compared to adults (Lima et al., 2013; Walter and Rey, 2003). Ongoing research in the use of ECT in children and adolescents identifies it as a treatment option when clinically appropriate (Ghaziuddin and Walter, 2013). It is exceptionally rare for ECT to be used in pre-adolescent children, yet it should be available for such patients if clinically indicated. In all cases in which ECT is considered for a child or adolescent, a second opinion of a child and adolescent psychiatrist should be obtained, in consultation with a psychiatrist experienced in ECT.

In patients where the medical risk of ECT is increased, which includes those with other severe medical conditions, a second opinion should be obtained from a psychiatrist experienced in ECT practice, as well as from the anaesthetist and other relevant specialists. There should be a specific plan documented by the psychiatrist to address the management of medical comorbidity during ECT, which may include appropriate specialist medical support. All patients receiving ECT should be closely monitored to detect the development of any adverse physical or cognitive effects.

Several systematic reviews have reported on the safety of ECT for the treatment of severe mental illness during pregnancy (Anderson and Reti, 2009; Leiknes et al., 2015; Miller, 1994; Sinha et al., 2017). Although the data are limited, it seems that ECT is an effective treatment during pregnancy and that the risks to mother and foetus are relatively low. These risks should be carefully weighed against those of other treatments, or no treatment. Principles to guide ECT during pregnancy developed jointly by anaesthetics, obstetrics and psychiatry are available to clinicians (Austin and Highet, 2017; Lakshmana et al., 2014). In pregnancy, screening and selection of appropriate patients is essential and should be conducted by a psychiatrist experienced in ECT, in consultation with both a psychiatrist with appropriate training and expertise in perinatal psychiatry and an obstetrician. Depending on the trimester of pregnancy, adjustments may be required to anaesthetic management to improve safety including left lateral or pelvic wedge tilt, adequate pre-oxygenation, avoidance of hyperventilation, premedication with an antacid or H2 blocker and intubation. Close monitoring of mother and foetus is essential before, during and after ECT including consideration of foetal heart rate monitoring with Doppler or cardiotocography (CTG). ECT after 20 weeks gestation should only be administered in hospitals where obstetric support is available.

Older age is associated with an increased rate of response (particularly for depression) (Brus et al., 2017) and improvement in quality of life (McCall et al., 2017) following treatment with ECT. It is a safe and well tolerated treatment in late-life depression. The cognitive side-effect profile for ECT in older people is comparable to mixed age populations, and baseline cognitive impairment should not preclude a patient from having ECT (Geduldig and Kellner, 2016). Older people are likely to have more medical comorbidities and are at possible increased risk of delirium during a course of ECT. Health issues such as frailty, ischaemic heart disease (IHD), hypertension, stroke, hyperkalaemia and anticoagulant use should be considered and managed, and appropriate specialist consultation, if required, should be sought. Older people are likely to have more medical comorbidities and are at possible increased risk of delirium due to their age. Routine medical assessments should be undertaken prior to administering ECT, as well as close ongoing monitoring during the treatment course.

Consent

Valid consent is essential for patients considering ECT and should be sought in line with principle 5 of the RANZCP Code of Ethics. The RANZCP (2017b) has also developed a table on special provisions governing informed consent for ECT.

In line with the principles of supported decision-making, enough information should be provided for patients to make an informed decision, including information about indications, alternative treatment options and the implications of not having the treatment. Details should also be provided about the treatment methodology and process, any side-effects or possible adverse events, including the risk of transient anterograde and retrograde cognitive impairment and, less commonly, irreversible retrograde memory loss particularly if bitemporal (BT) techniques are utilised (Sackeim et al., 2007). Patients should be informed about what to expect before, during and after the administration of the treatment. It is recommended that families and carers be involved in this process where possible, taking into account advanced directives, and ensuring patients are made aware that they can access another psychiatric opinion. Adequate time should be made available for patients and their families and carers to discuss any concerns with no coercion. Patients should be reminded of their right to withdraw consent and any time during the course of ECT. Information regarding consent, including withdrawal of consent, must be documented in the patient's medical record.

When seeking consent for ECT, psychiatrists should routinely consider whether a patient has capacity to consent to ECT as part of the consent process. For patients who are unable to consent to ECT and/or involuntary patients, psychiatrists must comply with local and national legislation in relation to ECT.

ECT administration

There are an increasing number of evidence-based ECT techniques with considerable variation in potential outcomes and adverse effects. Further details about the relative benefits and risks of the various techniques, particularly in relation to cognitive impairment and efficacy, are discussed below. There is a range of valid treatment approaches, and no single 'protocol' for administering ECT. The treatment approach needs to be individualised to the patient, their disorder and response to ECT. The choice of ECT technique will be dependent on the balance of effectiveness, need for speed of recovery and relevance of possible cognitive adverse effects.

The critical consideration is the combination of dosing, electrode placement, pulse width, session frequency, concomitant medication and anaesthetic approach. The treatment approach should be selected based on the needs of the individual patient and characteristics of the illness episode. ECT practice is constantly evolving in response to advances in technique and administration, with clinicians striving to optimise therapeutic effects and minimise undesired side-effects. Techniques that are cognitive sparing, yet with adequate efficacy for that patient, should initially be considered. The evidence-base is fundamentally important; however, clinician experience is also relevant in guiding treatment decisions.

The choice of electrode placement and dose of ECT needs to be determined for the individual patient, balancing efficacy against side-effects. The electrode placements commonly in use are right unilateral (RUL), bitemporal (BT), and bifrontal (BF). There are also reports of the use of left anterior right temporal (LART). The relative efficacy of each is dependent on dose relative to the individual's seizure threshold.

Psychiatrists who administer ECT have specialised knowledge and training in ECT, and a psychiatrist prescribing ECT may have only a general knowledge of new techniques. In those circumstances, it is strongly recommended the psychiatrist prescribing ECT seek advice from a psychiatrist who administers ECT to determine the optimal treatment for a given patient.

ECT threshold. Seizure threshold refers to the lowest electrical dose which elicits seizure activity, as seen on the electroencephalogram (i.e. slow wave activity), and/or visible motor movement. Stimulation at this level or just above (1.5× threshold) has been shown to be effective in bilateral electrode placements (BT, BF) and likely also applies to LART. Overall, studies have suggested that stimulation at seizure threshold has relatively low efficacy for unilateral ECT and that supra-threshold dosing, five to six times seizure threshold, is required to achieve efficacy over the course of RUL ECT treatment.

Three different methods are commonly used to estimate or determine seizure threshold: empirical dose titration, age and half-age methods. It is recommended that the stimulus is determined on an individualised basis using the dose titration method as age-based methods are less precise in determining an individual's seizure threshold.

ECT electrode placement and pulse width. Generally, BT and unilateral ECT are effective when dosed adequately (Semkovska et al., 2016), but cognitive side-effects are greater with BT placement and with higher stimulus doses (Carney et al., 2003; Kolshus et al., 2017; Malhi et al., 2015). Doses up to six times threshold can maximise the efficacy of unilateral ECT, while for bilateral ECT, doses at 1.5 times seizure threshold are usually sufficient.

It is important to note that ECT can cause retrograde amnesia (including for autobiographical memories) that can be persistent (Sackeim et al., 2007). The severity and risk of this occurring and persisting depend on the ECT treatment approach (electrode placement, pulse width and dosing level), number of treatments and patient risk factors, but cannot always be predicted beforehand. Generally, BT ECT carries the highest risk of retrograde amnesia and is not used as the initial form of ECT treatment given, unless there are specific reasons to do so, for example, the patient has not responded to other forms of ECT in the past, or an urgent, rapid treatment response is needed. The psychiatrist should carefully consider the different forms of ECT available, including combinations of electrode placement and pulse width, and prescribe the treatment approach most suited to the clinical condition of the individual patient. For all patients having ECT, it is essential that close monitoring is conducted throughout the ECT treatment course to detect the development of cognitive side-effects early (see sections below for further information on cognitive monitoring).

The use of BF ECT is increasing internationally, and is argued to have good therapeutic potential and a desirable side-effect profile compared to BT ECT (Dawkins, 2012; Dunne and McLoughlin, 2012). It has also been shown that BF ECT has less impact on the cardiac rhythm (during the stimulus) than other forms of ECT (Stewart et al., 2011), Therefore, BF ECT should be considered when treating patients at risk of ECT-induced arrhythmias.

It is of note that the following practice guidance to maximise ECT efficacy while minimising cognitive impairment was based upon a consensus reached by a group of Australian ECT experts, organised by the Royal Australian and New Zealand College of Psychiatrists, due to the lack of available evidence in this area.

Traditionally, ECT has been given with a 'brief' pulse width, defined as pulses of 0.5–2.0 ms in duration. The introduction of an ultrabrief pulse width (0.25–0.3 ms) for RUL ECT has made possible effective treatment with markedly fewer cognitive side-effects (Loo et al., 2008, 2015; Mayur et al., 2013; Sackeim et al., 2008; Spaans et al., 2013; Tor et al., 2015; Verwijk et al., 2012), though efficacy may be slightly reduced compared to brief-pulse RUL ECT (Brus et al., 2017; Tor et al., 2015), including a slower rate of response (Galletly et al., 2014; Loo et al., 2013). The published evidence in relation to use of an ultrabrief pulse width with bilateral forms of ECT is very limited, with the available data suggesting that efficacy is lower than with brief-pulse bilateral ECT (Sackeim et al., 2008; Sienaert et al., 2009, 2010). Psychiatrists considering the use of ultrabrief bilateral ECT should be aware of the limited evidence-base and relatively low efficacy of this form of ECT.

The use of a 0.5-ms pulse width (i.e. lower end of the 'brief' pulse range) for ECT is increasingly recognised in clinical practice in Australia and overseas. Discussion with overseas experts reveals that centres in United Kingdom and Europe are increasingly giving BT ECT with a 0.5-ms pulse width. Most randomised controlled trials (RCT) comparing different forms of ECT have used a 1.0-ms pulse width for brief-pulse ECT. Thus, there is limited randomised evidence for outcomes with 0.5-ms pulse ECT, though there are some recent studies (Bjølseth et al., 2015; Dybedal et al., 2016). The effects of varying the pulse width, derived from computational modelling, suggest that the clinical effects (efficacy and cognition) of 0.5-ms pulse ECT will be intermediate between that of 1.0-ms pulse ECT and ultrabrief (0.3 ms) pulse ECT (Bai et al., 2012a, 2012b). A recent large data set from real-world clinical practice found that lowering the

Table 1. Considerations for ECT electrode placements, pulse width and threshold.

Electrode placement	Recommended parameters for pulse width and threshold	
For right unilateral (RUL) ECT	Ultrabrief pulse width (0.3 ms) at 6× threshold	1.0-ms pulse width at 5–6× threshold[a]
	0.5-ms pulse width at 5–6× threshold is recommended, noting lower level of evidence	
For bifrontal (BF) ECT	1.0-ms pulse width at 1.5× threshold	0.5-ms pulse width at 1.5–2.5× threshold
For bitemporal (BT) ECT	1.0-ms pulse width at 1.5× threshold	0.5-ms pulse width at 1.5–2.5× threshold

ECT: electroconvulsive therapy.
[a]Lower dose levels (3× threshold) have been shown to have lower, though still clinically meaningful efficacy.

pulse width is associated with a reduction in efficacy (Brus et al., 2017). This should be taken into account when determining the dose relative to seizure threshold when a 0.5-ms pulse width is used for ECT. Generally, higher doses (relative to seizure threshold) need to be given when reducing the pulse width, to achieve similar efficacy (Loo et al., 2015). Thus, for RUL ECT given with a 0.5-ms pulse width, a dose of at least 5× seizure threshold is recommended. For BT and BF ECT with 0.5-ms pulse width, dosing at 1.5× seizure threshold is likely to be less efficacious than BT and BF ECT given with a 1.0-ms pulse width at 1.5× seizure threshold, based on the observation that higher dose levels (relative to seizure threshold) may be required to achieve equivalent efficacy when the pulse width is reduced (Loo et al., 2015). Efficacy could be increased by dosing at 2–2.5× seizure threshold for BT and BF ECT given with a 0.5-ms pulse width.

As a general recommendation to balance efficacy against side-effects, psychiatrists should consider using one of the options outlined in Table 1. The below recommendations are based on evidence from clinical trials, extrapolation from other sources of information (e.g. published findings from large clinical data sets and computational modelling) and expert consensus.

Choice of ECT treatment approach should be determined by balancing the need for speed of response, the urgency of the clinical situation, the patient's previous response and concern regarding potential cognitive side-effects. The use of combinations of electrode placement, pulse width and dosing other than those above should be very carefully considered before proceeding.

If treatment is commenced unilaterally, consider switching from brief-pulse unilateral to brief-pulse BF or BT ECT if there is no improvement after four to six treatments. Re-titration is recommended as seizure threshold will be different when a different form of ECT is used. Prior to making this decision, it is important to carefully assess whether other factors such as anaesthetic technique or concurrent medication may be compromising the efficacy of the ECT. As individual patients improve at different rates, the clinician should be aware that for some patients, switching after four treatments may be premature as discernible improvement may not occur before treatment number six. Consider switching from ultrabrief RUL to brief-pulse RUL, BF or BT ECT if there is no improvement after six to eight treatments. The decision to switch earlier should be influenced by the need or otherwise for a rapid response.

Patients and their families should be encouraged to have an active role in deciding the type of ECT, with psychiatrists explaining that there are multiple factors affecting ECT effectiveness and side-effects. For example, while ultrabrief RUL ECT causes fewer cognitive effects than brief-pulse RUL ECT, these treatments also generally require more treatments over a longer period, for example, 9.6 compared to 8.7 in a systematic review (Tor et al., 2015). Furthermore, in 25–50% of patients, this treatment may not lead to significant clinical improvement and there may need to be a need to switch to an alternative form of ECT (Galletly et al., 2014; Loo et al., 2008).

The prescription of ECT for the treatment of schizophrenia may be considered in combination with antipsychotic medication when a rapid clinical response is an urgent priority, and the addition of ECT may augment outcomes for people with treatment-resistant schizophrenia who have an inadequate response to antipsychotic medication alone (Galletly et al., 2016). ECT can be effective in conjunction with antipsychotic medication for acute positive symptoms. Co-morbid depression with schizophrenia can at times present like 'residual schizophrenia' and the depression may also respond to ECT. There is no evidence that negative symptoms of schizophrenia respond to ECT. The adverse cognitive effects of ECT in people with schizophrenia appear to be consistent with those observed in the treatment of depression (Galletly et al., 2016). A limited analysis of data from studies comparing BT and unilateral ECT (Tharyan and Adams, 2005) found no clear advantage for either electrode placement.

It is unclear if there is an optimal ECT electrode placement for the treatment of schizophrenia. At least one published study suggests that BF ECT may be as effective or more effective than BT ECT in people with schizophrenia, with the added benefit of causing less cognitive impairment (Phutane et al., 2013) although this finding is yet to be replicated.

Ultrabrief ECT is likely to have significant advantages in reducing cognitive side-effects, although the evidence of efficacy in schizophrenia is limited.

Anaesthetic management. Anaesthetic management, undertaken by an anaesthetist, is an important aspect of ECT administration that, if provided optimally, can improve ECT outcomes. There should always be an anaesthetic review prior to treatment, with specific consideration given to patients perceived to be at increased medical risk from ECT. It is noted that the circumstances of each individual patient will differ greatly and hence decisions regarding appropriate anaesthetic techniques should be decided through consultation between the anaesthetist and the psychiatrist for each individual patient (Bryson et al., 2017). Overarching principles for anaesthesia for ECT include the following:

- Ensuring seizure threshold is not excessively elevated by drugs or doses used.
- Optimising ventilatory management.
- Minimising cognitive impact in terms of drugs and techniques used.
- Using drugs and techniques to minimise other risks such as respiratory depression.
- Recognising the particular risks of ECT such as cardiac arrhythmias.
- Monitoring appropriate physiological parameters during the procedure.

Acknowledging that there is a need for individualised anaesthetic management, there are further specific issues, outlined below, that may aid discussion between psychiatrists and anaesthetists when considering the types and doses of anaesthetic and other agents that may help in delivering anaesthesia in line with the above principles.

General anaesthetic induction should be used – typically used agents are propofol, thiopentone methohexital, etomidate and ketamine. The most commonly used agents, propofol and thiopentone, are potent anticonvulsants so the lowest effective anaesthetic dose should be used.

The addition of remifentanil or other short acting opiates enables the reduction in dose of the induction agent and thus potentially lowers seizure threshold. These drugs do not directly reduce seizure threshold or enhance the clinical outcome, but they do reduce the anticonvulsive effect of anaesthetics as less of the dose can be administered preventing the need to increase the stimulus dose, which may lead to a better cognitive outcome. This strategy transforms an anaesthetic with a single anaesthetic agent into a more complicated procedure and anaesthetists using this approach need to be aware of the risks and the management of these risks. In particular, this technique carries a risk that the patient is too lightly induced and may be aware of the procedure. Careful monitoring is essential. The isolated limb technique can be very helpful. The patient is asked to 'move your right foot!' immediately prior to the delivery of the stimulus enabling the anaesthetist to administer a further dose of the induction agent before treatment is administered if required.

Adequate muscle relaxant should be used – usually suxamethonium. A small dose of rocuronium, or vecuronium, may be administered before suxamethonium to minimise the suxamethonium-induced myalgia. Rocuronium, as a curare-like muscle relaxant, should be considered in cases of pseudocholinesterase deficiency where there is prolonged paralysis even with low doses of suxamethonium. The effect of rocuronium can be reversed using sugammadex, but the combination is presently very expensive.

Adequate oxygenation is essential. Hyperventilation increases neuromuscular excitability, may enhance seizure production, improve treatment outcomes (Aksay et al., 2014; Haeck et al., 2011; Mayer et al., 2010) and reduce acute cognitive adverse effects (Haeck et al., 2011).

Ketamine has been used successfully as an anaesthetic agent in some clinics alone, or in combination with remifentanil, thiopentone or propofol (reducing the dose of ketamine to minimise the risk of psychotomimetic side-effects). It has less effect on the seizure threshold compared to propofol and thiopentone, enabling a lower ECT stimulus dose to be administered. Use of ketamine in ECT anaesthesia may lead to earlier improvement, but evidence to date suggests that overall improvement over the ECT course is not increased (Gálvez et al., 2017; Li, 2017; McGirr et al., 2017). If ketamine is used, it may prolong recovery time and can be associated with a psychomimetic emergence delirium with patients experiencing illusions, hallucinations and dissociative symptoms (Gálvez et al., 2017). Side-effects of repeated dosing with ketamine should also be monitored; for example, cystitis, liver function abnormalities, dissociative symptoms and development of dependency (Short et al., 2017).

An appropriate bite block should be used after anaesthetic induction and before ECT stimulation is given, to reduce the risk of dental injury. All ECT should be conducted in a licenced facility with appropriate staffing, equipment, recovery facilities and emergency access. Appropriate standards and recommendations are documented in relevant Australian and New Zealand College of Anaesthetists (ANZCA) professional practice documents including: PS04 Recommendations for the Post-Anaesthesia Recovery Room; PS08 Statement on the Assistant for the Anaesthetist; PS09 Guidelines on Sedation and/or Analgesia for Diagnostic and Interventional Medical, Dental or Surgical Procedures; and PS55 Recommendations on Minimum Facilities for Safe Administration of Anaesthesia in Operating Suites and Other Anaesthetising Locations.

Assessment prior to procedure. Psychiatrists must ensure that a pre-ECT evaluation is undertaken that includes physical and psychiatric assessment, a baseline cognitive screen, as well as consideration of relevant investigations. The

comprehensive examination of the patient must be completed and documented prior to commencing ECT. A medication review must also be completed prior to the administration of ECT, with the aim of optimising medication to reduce interference with seizure generation and maximise safety of the procedure. Investigations should include full blood examination (FBE), urea and electrolytes test (U/E), electrocardiogram (ECG) and chest X-ray if medically indicated. Neuroimaging may be undertaken if clinically indicated. There should be an anaesthetic review and a specialist medical review of severe comorbid medical conditions. Consideration should be given to pre-treatment for cardiac comorbidity (e.g. hypertension and tachycardia) as well as other issues such as migraine. A second opinion from a psychiatrist, post-assessment, should be sought in complex and high-risk presentations. Valid consent must also be obtained.

Monitoring during the procedure. A 'time out procedure' must be conducted as an essential part of ECT practice to ensure correct patient, correct electrode placement, correct dose and pulse width, correct anaesthetic drugs and doses as well as complete induction. As above, the isolated limb technique is useful in monitoring for awareness.

Treatment must include monitoring of the seizure. Electroencephalography (EEG) monitoring is used to monitor seizure quality across the course of treatment. There is substantial inter-individual variability in seizure quality, with older patients often having poorer quality seizures, though this does not indicate poor response to ECT. Other reasons for a poor seizure could include anticonvulsant drugs, poor baseline recording, poor contact of leads, movement artefact and variation in anaesthetic technique. If there is lack of clinical progress, increase in the ECT dose may be appropriate, but other options should also be considered, including adequate discussion with the anaesthetist about minimising the dose of the induction agent, addition of an short acting narcotic agent or changing to a drug that is known to have less impact on the seizure threshold, that is, the ECT dose should be carefully controlled to prevent unnecessary cognitive impairment.

Consideration should be given to the management of the common side-effects of ECT, including headache and nausea (Isuru et al., 2017; Leung et al., 2003; Li et al., 2011). Consideration should also be given to the management of dentition to minimise dental loss and damage during the procedure.

Patients should be monitored closely during a course of ECT with their progress and side-effects recorded regularly in the medical record, with safety of the patient paramount.

Monitoring during the treatment course. Ongoing monitoring during the course should include assessment of efficacy and cognitive function, and routine monitoring of EEG quality. These should inform decision-making regarding ECT prescription (dosage and treatment frequency) and/or anaesthetic approach. While a patient may be prescribed several ECT treatments in advance, it is not recommended to schedule all of the ECT treatments within the prescribed course in advance. There should be at least weekly review to allow for adequate monitoring of progress and cognitive effects, and adjustment of the ECT prescription as necessary.

Clinical assessments should be performed to assess and document efficacy and cognitive performance throughout the course of ECT. Assessments should be carried out before the course of ECT commences (as a baseline), during the course of acute treatment, and at the end of the acute ECT course. Periodic assessments should also occur during continuation/maintenance ECT to monitor outcomes. Medical complications should be documented and discussed with others involved in the treatment and, if necessary, the anaesthetic team.

The number of ECT treatments required by a patient in a course of treatment should be guided by the patient's progress and clinical improvement. Generally, a course of ECT involves 6–12 treatments. Longer courses may be needed for some patients who respond slowly to ECT. In this circumstance, regular clinical reviews and documentation of progress to date, and reasons for ongoing treatment, are strongly recommended. In general, catatonia responds more rapidly to ECT treatment than depression and treatment-resistant schizophrenia and mania. A second opinion from a psychiatrist is recommended if more than 12 treatments are given in an acute course. Patients may also require continuation or maintenance ECT. The duration of treatment is determined by the clinical outcome and possible adverse events and not by a predetermined number of treatments.

When monitoring an ECT course, consideration must be given to the possibility of adverse effects of the treatment, and these should be documented and reported according to relevant state and institutional requirements. The service providing ECT has the responsibility for evaluation of the quality and safety of their service.

Consideration should be given to the use of validated monitoring scales, for example, the Montgomery–Åsberg Depression Rating Scale (MADRS), to assess ongoing clinical condition, including suicide risk.

Memory impairment is the side-effect of most concern to patients, their families and to the public. Anterograde and retrograde memories are variably affected. Anterograde memory changes generally return to normal or may be improved compared to pre-ECT levels within 2–4 weeks (Semkovska and McLoughlin, 2010), but retrograde memory changes, including autobiographical impairment, are more likely with BT placement and can persist for weeks to months after ECT (Sackeim et al., 2007). It is also possible that long-term autobiographical memory impairment may persist permanently (Sackeim et al., 2007). Patients

should be advised that some people have significant cognitive side-effects after a course of ECT. This should be taken into account in terms of any plans to make major life decisions, and the ability to drive, particularly in the first month after ECT.

There are measures of retrograde memory impairment, including autobiographical memory, but even short versions of these instruments require at least 20 minutes to administer. Measurement of time to re-orientation after each ECT treatment is a simple, brief measure of retrograde memory function, and has been demonstrated to usefully indicate, during the ECT course, the cumulative development of retrograde memory impairment (Martin et al., 2015). The routine monitoring of re-orientation is recommended, using a structured scale immediately following each ECT treatment (Martin et al., 2017, 2018). These scores should be reviewed frequently during the ECT course, ideally prior to each ECT treatment, so that the ECT treatment approach can be adjusted as needed if outcomes suggest a developing risk of retrograde amnesia. Actions that might reduce the risk of severe and/or persistent retrograde amnesia include spacing ECT treatments further apart, or switching to a unilateral placement or shorter pulse width, noting that these actions may reduce efficacy. This monitoring can also inform other decisions throughout the ECT course, such as whether to continue, suspend or cease the course of ECT.

To monitor for the development of anterograde amnesia, a cognitive assessment tool such as the Brief ECT Cognitive Screen (Martin et al., 2013) administered pre-ECT and after the first week of treatment can be useful to detect early emerging deficits, so treatment can be adjusted. Assessment tools to evaluate cognitive outcomes should be undertaken before during and after the end of the ECT course. A useful brief tool for this is the Montreal Cognitive Assessment (MoCA) (Nasreddine et al., 2005).

Psychiatrists should also consider referring the patient for neuropsychological consultation for comprehensive neuropsychological examination if indicated. The use of multiple ECTs (the delivery of more than one adequate seizure per treatment session) is not acceptable practice, except in a session where threshold is being determined. In a titration session, the psychiatrist may decide to give a supra-threshold treatment dose, depending on clinical urgency. Although adequate supra-threshold dosing is important to achieve efficacy over the course of ECT treatment, there are reports that threshold-level dosing may be effective in the first ECT session, even for RUL ECT, negating the need to re-stimulate (Kellner et al., 2010). If the decision is made to give a second stimulus at a higher dose in a session, due to the first seizure being inadequate, the second stimulus is often given after a brief delay, for example, 60–90 seconds. The psychiatrist needs to be aware that if the delay is too long and a 'top up' dose of anaesthetic agent is required, the resultant stimulation and seizure could be poor, negating the potential benefit of restimulation while potentially worsening cognitive outcome.

Privacy and professional practice issues. Administration of ECT should be conducted in a respectful manner and privacy should be maintained throughout the procedure. Where more than one patient is having ECT, there should be separate areas for those waiting for ECT and for those in recovery. It is not appropriate for a patient to be receiving ECT when another patient is recovering or waiting for treatment in the same room.

Discharge of community patients who have undergone an ECT procedure should be reviewed with input from the anaesthetist, take into account the individual patient circumstance and ensure that patient safety is not compromised.

Maintenance and continuation ECT

Following a course of ECT, relapse rates within 12 months have been shown to be over 50% with the majority relapsing in the first 6 months despite maintenance pharmacotherapy or ECT (Jelovac et al., 2013; Kellner et al., 2006; Prudic et al., 2004; Tew et al., 2007). To assist with reducing relapse, tapering of an index course of treatment over a few weeks can be useful for many patients, rather than abruptly ceasing treatment. In some cases, patients may require treatment with continuation or maintenance ECT if other treatments have not been effective in preventing illness relapse. Evidence has been insufficient to until recently to produce a clear consensus on what best practice maintenance ECT although comprehensive, practical, clinically based recommendations for ECT clinicians and services are available (Gill and Kellner, 2018).

Continuation ECT consists of further treatments given within the first 6 months after the end of the acute treatment course, in order to prevent relapse. It typically ranges from an ECT treatment given every week to every 3–4 weeks, or occasionally less often. A fixed schedule of maintenance ECT may be less effective and a dynamic approach, with clinically indicated variance in treatment frequency, should be considered with regular clinical review taking into consideration the patient's current mental state.

If an index course of ECT is effective for a patient, continuation ECT should be considered, particularly for patients with severe and recurrent illness. For schizophrenia, continuation ECT should be used in combination with antipsychotic medication, with flexibility in the frequency accordingly to take account of response and side-effects. In the only RCT of continuation ECT for people with treatment-resistant schizophrenia, rates of relapse were much lower with the combination of ECT and antipsychotics compared with either treatment alone (Chanpattana et al., 1999).

Maintenance ECT occurs after the decision has been made to continue ECT in combination with other treatments, after a 6 month period. With regard to maintenance ECT, the

overall treatment plan should be reviewed regularly with consideration given to new pharmacological and psychotherapeutic options that may enable the person to remain well without the need for ongoing ECT.

A psychiatrist proposing continuation or maintenance ECT should explain to the patient the rationale for such proposed treatments and discuss the evidence to justify its use in the patient's particular circumstances. This includes explaining alternatives to the treatment, and the possible risks and benefits of proceeding with each alternative.

Medication and ECT

The use of evidence-based pharmacotherapy and other non-pharmacological strategies to prevent relapse after improvement from ECT is essential for obtaining a lasting improvement. It is essential to review psychotropic medication prior to commencing ECT and develop a plan for medication management during and after index ECT. The aim is to optimise the efficacy of index ECT and reduce the risk of subsequent relapse. Tricyclic antidepressants (TCAs) may lower the seizure threshold and may increase the risk of cardiac arrhythmias, particularly in elderly people and those with cardiac disease. However, a balanced approach should be considered as nortriptyline has been shown to be relatively safe and may improve cognitive outcomes (Haskett et al., 2007; Sackeim et al., 2009). Combining antidepressant medication with lithium after index ECT has been demonstrated to significantly reduce the risk of relapse and should be considered in all patients who do not have a specific contraindication to its use (Kellner et al., 2016; Sackeim et al., 2001). Lithium has been reported to increase the risk of post-ECT delirium during a course of acute index ECT in some patients (Loo et al., 2011). Higher serum levels (above 0.6) are particularly associated with risk, and lower serum levels during an acute course of ECT are recommended (Thirthalli et al., 2011) in situations where it is essential to continue lithium treatment during acute index ECT (e.g. in patients at high risk of manic switch and in whom other mood stabiliser medications are ineffective and cannot be used). This can be achieved by lowering the regular dose of lithium and withholding it the night before and morning of the treatment.

Consideration should be given to ceasing benzodiazepines and anticonvulsants (when used as mood stabilisers) before ECT treatment. Studies in this area are limited and inconclusive, with one recent review showing benzodiazepines decrease seizure duration, but rarely increase seizure threshold – and reduce response in RUL ECT but not bilateral ECT – while anticonvulsants can increase, decrease or have no effect on seizure threshold and seizure duration (Tang et al., 2017). The general consensus is that benzodiazepines potentially shorten seizure duration and decrease treatment efficacy, particularly when administering RUL ECT (Greenberg and Pettinati, 1993). Analysis of a recent large national ECT data set found that concurrent treatment with benzodiazepines or with lamotrigine was associated with poorer efficacy outcomes (Brus et al., 2017). Reducing the dose and/or ceasing these medications minimises the need for excessive treatment doses and may reduce the risk of cognitive adverse events (Weiss, 2018). Sometimes ECT has to be commenced before anticonvulsant medication is ceased or washed out.

Antipsychotics for psychosis have been shown to improve acute positive symptoms and work synergistically with ECT (Braga and Petrides, 2005; Chanpattana and Sackeim, 2010). The combination of ECT with clozapine may be of particular benefit for people who have an inadequate response to clozapine alone (Havaki-Kontaxaki et al., 2006; Lally et al., 2016; Petrides et al., 2015).

Regular oral antihypertensive, cardiac medications and anti-reflux drugs should be administered to prevent adverse events and the anaesthetist informed. A small amount of water can be taken to help the patient swallow their medication.

Skills required for delivering ECT

ECT by psychiatrists. All psychiatrists who are administering ECT should be credentialed in ECT practice. Every ECT service should have a process for the assessment and subsequent credentialing and re-credentialing of psychiatrists to administer ECT to ensure that they meet required professional standards. This should be undertaken in accordance with local requirements and institutions that deliver ECT should specifically detail the institution's credentialing requirements.

At a minimum, a credentialed psychiatrist must meet the standard outlined in RANZCP (2012) ECT Entrustable Professional Activity (EPA). The assessment of suitability for credentialing to administer ECT should consider the following:

- Performing, or personally supervising, ECT treatments regularly across a range of clinical situations and at different stages of the ECT course.
- Demonstration of maintenance of knowledge and practical skills through ongoing continuing education and practice improvement activities in ECT (including recognised ECT courses, conferences, peer review groups and quality improvement activities).

To be credentialed to administer ECT, a formal assessment of the psychiatrist's practical skills in ECT administration should also be performed by a site Director of ECT or equivalent (a psychiatrist), and a determination made that the required standard has been met as a form of practice review and quality assurance. The psychiatrist performing the credentialing should have expertise and detailed knowledge of current ECT practice. Psychiatrists undergoing training in ECT administration should only

administer ECT under the direct supervision of a credentialed psychiatrist.

ECT by psychiatry trainees. If medical practitioners other than psychiatrists (i.e. trainees) are to administer ECT alone, without direct supervision, they must meet the same standards as required for a credentialed psychiatrist. Completion of the ECT EPA is required as a minimum for a trainee psychiatrist to administer ECT without direct supervision, though there may be additional local requirements as well. It is important to note that in some jurisdictions, only qualified psychiatrists can administer ECT. Trainee psychiatrists administering ECT alone, without direct supervision, should familiarise themselves with the process for seeking further advice or assistance as required, for example, from the on-call psychiatrist.

Ongoing education. Ongoing education is important to ensure that all psychiatrists maintain a detailed understanding of when ECT is indicated. It is, however, acknowledged that ECT is a constantly evolving practice, and it is important to ensure that the technical procedure is applied optimally for any given patient. The psychiatrist prescribing ECT should, therefore, be familiar with recent advances in ECT treatment approaches, including the effects of varying electrode placement, dosing and stimulus parameters, and the interaction of these factors. Where required, psychiatrists may need to collaborate to make the determination as to what modality of ECT is required by consulting with colleagues with more ECT prescribing knowledge and experience as a way of improving knowledge in this area. Psychiatrists credentialed to deliver ECT should also collaborate and share ECT knowledge with colleagues, for example, through peer review groups.

Outcome-based measures

It is essential for all sites delivering ECT to have systems in place for monitoring efficacy, cognitive outcomes and other adverse effects of ECT. Formal assessment of symptom severity and cognition should occur before, during and at the end of treatment. These measures should be incorporated into routine clinical practice to guide treatment for individual patients. A regular clinical audit process, conducted at least annually, should also be in place to ensure high-quality patient-focused treatment is always delivered.

Patient engagement and cultural factors

It is essential to involve patients and their carers and/or family/whānau[1] in ECT practice. Cultural considerations are important, and culturally appropriate engagement with family and kinship networks for Aboriginal and Torres Strait Islander peoples, Māori and other cultural groups is required (Hunt, 2013; RANZCP, 2014). Listening to their lived experience of the treatment and using this knowledge to improve ECT services is fundamental to the development of high-quality services.

While psychiatrists should do everything possible to minimise adverse effects of ECT, there is a need to acknowledge risks associated with ECT and inform and discuss them with people having ECT and their carers and family/whānau. These discussions should include information about the type of ECT to be administered (including electrode placement) and expected outcomes. Open discussion of these issues can help to address stigma associated with ECT as a treatment.

Psychiatrists should refer patients to relevant consumer information as necessary, such as the RANZCP (2017c) consumer information on ECT.

Governance and research

Any service providing ECT should maintain adequate documentation, comply with appropriate guidelines and legislation, have in place appropriate risk management procedures, and procedures for dealing with complaints and adverse outcomes. Governance should be overseen by an ECT Management Committee or equivalent governing body to ensure that standards of ECT practice are maintained. A committee is required for a hospital, or for an agreed area covering smaller sites with fewer patient numbers, to ensure the provision of sufficient expertise and support. Membership of the committee should be led by a Clinical Director of ECT or equivalent (a psychiatrist) and include a senior clinical nurse for ECT or equivalent, plus a range of other relevant anaesthetic and administrative staff. The service should be accredited against an appropriate set of standards, policies and clinical guidelines – including clinical governance, equipment, and safety and quality outcomes.

There is a need to develop a strong and stable neurostimulation team that will operate an integrated care team–based approach. This team (the neurostimulation clinic) will have the capacity to not only assist in the delivery of measurement based best practice ECT but also offer other neurostimulation techniques, like repetitive transcranial magnetic stimulation (rTMS), increasing the treatment options available to patients. The team should develop a vision to drive the service identifying key concepts that provide governance and credibility. Essential members include: the neurostimulation nurse coordinator, the neurostimulation psychiatrist, the anaesthetist and other relevant staff (Weiss, 2018). The team would develop a high level of expertise and clear lines of communication within the team as well as with the patient's main treating psychiatrist. Clear and open communication is vital for patient-focused, evidence-based ECT practice.

Psychiatrists should contribute to continued service development, quality improvement and research by

monitoring treatment outcomes, including adverse effects. This is important for both established and evolving ECT techniques to contribute to a more complete understanding and improvement in clinical practice.

Further guidelines for ECT

ECT must be performed within legislative requirements as defined in Australian state and territory and New Zealand Mental Health Acts. It is advised that psychiatrists read and familiarise themselves with the relevant requirements for ECT within the jurisdiction in which they practice. The RANZCP has prepared a comparison table of regulation of ECT in Australian and New Zealand Mental Health Acts, as well as a table on special provisions governing informed consent for ECT for reference. Further local guidelines are also available as follows:

- New South Wales Department of Health. *ECT Minimum Standards of Practice in NSW*. Sydney: NSW Department of Health, 2010.
- Victoria Department of Health and Human Services. *Chief Psychiatrist's guideline on electroconvulsive treatment*, December 2015.
- Western Australia, *Chief Psychiatrist's Practice Standards for the Administration of Electroconvulsive Therapy*, October 2015.
- Queensland Health, *Guideline for the Administration of ECT*, March 2017.
- South Australia Office of the Chief Psychiatrist. *Electroconvulsive Therapy Standard*, July 2014.
- New Zealand Ministry of Health. *Guidelines to the Mental Health (Compulsory Assessment and Treatment) Act 1992*, 2012.

Tasmania, Australian Capital Territory and the Northern Territory do not have any specific guidelines on ECT, but psychiatrists should familiarise themselves with any requirements detailed in the relevant mental health acts.

Conclusion

These guidelines provide up-to-date information for psychiatrists to enhance their commitment to promoting optimal standards of ECT practice. The guidelines should be an integral feature of training and professional development activities, and considered by ECT service providers. The RANZCP hopes that these guidelines will contribute substantially to improving ECT standards and assist psychiatrists in attaining a high standard of professional practice which will benefit their patients. These guidelines will be reviewed every 3 years to maintain currency and usefulness to practice.

Acknowledgements

The authors acknowledge all members of the Section of Electroconvulsive Therapy and Neurostimulation who contributed to the development of these guidelines, particularly Dr Carol Dean and Dr Tibor Csizmadia who provided necessary input from a New Zealand perspective, and to Dr Brett Simpson and Dr Shane Gill for their expert comments. Gratitude is also extended to RANZCP committees and the Australian and New Zealand College of Anaesthetists who provided helpful feedback to inform development of these guidelines.

Special Acknowledgements

Felicity Kenn, Policy Advisor, Practice, Policy and Partnerships Department, Royal Australian and New Zealand College of Psychiatrists.

Disclaimer

Compiled for the Royal Australian and New Zealand College of Psychiatrists (RANZCP), this information and advice are intended to provide general guidance to practitioners as on the date of publication and should not be relied on as a substitute for proper assessment with respect to the merits of each case and the needs of the patient. The RANZCP endeavours to ensure that information is accurate and current at the time of preparation, but takes no responsibility for matters arising from relying upon the information contained in this publication, or from changed circumstances or information or material that may have become subsequently available.

Declaration of Conflicting Interests

Members of the working group of the Section of Electroconvulsive Therapy and Neurostimulation (SEN) who developed these guidelines signed a deed of undertaking at the time of appointment to the SEN in which they agreed to declare any conflict, whether actual, potential, perceived or likely to arise. To manage conflicts of interest during the development process, a standing item at all SEN Executive meetings asked all members to declare their conflicts of interest. Working group members' individual declarations of interest are listed in Supplemental Appendix 1.

Funding

The development of these guidelines was supported by the RANZCP. The RANZCP acknowledges the significant pro-bono input of RANZCP Fellows and other expert contributors in the development of this guideline. The RANZCP thanks those who have given their time, experience and expertise. The authors received no financial support for the research, authorship and/or publication of this article.

Supplemental Material

Supplemental material for this article is available online.

Note

1. Whānau' (pronunciation: *fa:naʉ*) is a Māori word used to describe an extended family group spanning three to four

generations. The whānau continues to form the basic unit of Māori society.

References

Aksay SS, Bumb JM, Janke C, et al. (2014) New evidence for seizure quality improvement by hyperoxia and mild hypocapnia. *Journal of ECT* 30: 287–291.

Anderson E and Reti I (2009) ECT in pregnancy: A review of the literature from 1941 to 2007. *Psychosomatic Medicine* 71: 235–242.

Austin M and Highet N (2017) *Effective Mental Health Care in the Perinatal Period: Australian Clinical Practice Guideline*. Melbourne, VIC, Australia: Centre of Perinatal Excellence.

Bai S, Loo C, Al Abed A, et al. (2012a) A computational model of direct brain excitation induced by electroconvulsive therapy: Comparison among three conventional electrode placements. *Brain Stimulation* 5: 408–421.

Bai S, Loo C and Dokos S (2012b) Effects of electroconvulsive therapy stimulus pulsewidth and amplitude computed with an anatomically-realistic head model. In: *Proceedings of the annual international conference of the IEEE engineering in medicine and biology society*, San Diego, CA, 28 August–1 September, pp. 2559–2562. New York: IEEE.

Bjølseth TM, Engedal K, Benth JŠ, et al. (2015) Clinical efficacy of formula-based bifrontal versus right unilateral electroconvulsive therapy (ECT) in the treatment of major depression among elderly patients: A pragmatic, randomized, assessor-blinded, controlled trial. *Journal of Affective Disorders* 175: 8–17.

Braga R and Petrides G (2005) The combined use of electroconvulsive therapy and antipsychotics in patients with schizophrenia. *Journal of ECT* 21: 75–83.

Brus O, Cao Y, Gustafsson E, et al. (2017) Self-assessed remission rates after electroconvulsive therapy of depressive disorders. *European Psychiatry* 45: 154–160.

Bryson EO, Aloysi AS, Farber KG, et al. (2017) Individualized anesthetic management for patients undergoing electroconvulsive therapy: A review of current practice. *Anesthesia and Analgesia* 124: 1943–1956.

Carney S, Cowen P, Geddes J, et al. (2003) Efficacy and safety of electroconvulsive therapy in depressive disorders: A systematic review and meta-analysis. *The Lancet* 361: 799–808.

Chanpattana W and Sackeim H (2010) Electroconvulsive therapy in treatment-resistant schizophrenia: Prediction of response and the nature of symptomatic improvement. *Journal of ECT* 26: 289–298.

Chanpattana W, Chakrabhand M, Sackeim HA, et al. (1999) Continuation ECT in treatment-resistant schizophrenia: A controlled study. *Journal of ECT* 15: 178–192.

Dawkins K (2012) Refinements in ECT techniques. *Psychiatric Times* 29: 41–46.

Dunne RA and McLoughlin DM (2012) Systematic review and meta-analysis of bifrontal electroconvulsive therapy versus bilateral and unilateral electroconvulsive therapy in depression. *The World Journal of Biological Psychiatry* 13: 248–258.

Dybedal GS, Bjølseth TM, Benth JŠ, et al. (2016) Cognitive effects of bifrontal versus right unilateral electroconvulsive therapy in the treatment of major depression in elderly patients: A randomized, controlled trial. *Journal of ECT* 32: 151–158.

Galletly C, Castle D, Dark F, et al. (2016) Royal Australian and New Zealand College of Psychiatrists clinical practice guidelines for the management of schizophrenia and related disorders. *Australian & New Zealand Journal of Psychiatry* 50: 410–472.

Galletly C, Clarke P, Paterson T, et al. (2014) Practical considerations in the use of ultrabrief ECT in clinical practice. *Journal of ECT* 30: 10–14.

Gálvez V, Li A, Oxley C, et al. (2016) Health related quality of life after ECT for depression: A study exploring the role of different electrode-placements and pulse-widths. *Journal of Affective Disorders* 206: 268–272.

Gálvez V, McGuirk L and Loo CK (2017) The use of ketamine in ECT anaesthesia: A systematic review and critical commentary on efficacy, cognitive, safety and seizure outcomes. *The World Journal of Biological Psychiatry* 18: 424–444.

Geduldig ET and Kellner CH (2016) Electroconvulsive therapy in the elderly: New findings in geriatric depression. *Current Psychiatry Reports* 18: 40.

Ghaziuddin N and Walter G (2013) *Electroconvulsive Therapy in Children and Adolescents*. Oxford: Oxford University Press.

Gill SP and Kellner CH (2018) Clinical practice recommendations for continuation and maintenance electroconvulsive therapy for depression: outcomes from a review of the evidence and a consensus workshop held in Australia in May 2017. Journal of ECT 35: 14–20.

Glass OM, Forester BP and Hermida AP (2017) Electroconvulsive therapy (ECT) for treating agitation in dementia (major neurocognitive disorder)–A promising option. *International Psychogeriatrics* 29: 717–726.

Greenberg RM and Pettinati HM (1993) Benzodiazepines and electroconvulsive therapy. *Convulsive Therapy* 9: 262–273.

Haeck M, Gillmann B, Janouschek H, et al. (2011) Electroconvulsive therapy can benefit from controlled hyperventilation using a laryngeal mask. *European Archives of Psychiatry and Clinical Neuroscience* 261(Suppl. 2): S172–S176.

Haskett R, Rosenquist P, McCall V, et al. (2007) The role of antidepressant medications during ECT: New findings from OPT-ECT. *Journal of ECT* 23: 135–136.

Havaki-Kontaxaki B, Ferentinos P and Kontaxakis V (2006) Concurrent administration of clozapine and electroconvulsive therapy in clozapine-resistant schizophrenia. *Clinical Neuropharmacology* 29: 52–56.

Hunt J (2013) *Engaging with Indigenous Australia – Exploring the conditions for effective relationships with Aboriginal and Torres Strait islander communities*. Produced for the Closing the Gap Clearinghouse, Issues paper no. 5, 4 October. Canberra, ACT, Australia: Australian Institute of Health and Welfare; Melbourne, VIC, Australia: Australian Institute of Family Studies.

Isserles M, Daskalakis ZJ, Kumar S, et al. (2017) Clinical effectiveness and tolerability of electroconvulsive therapy in patients with neuropsychiatric symptoms of dementia. *Journal of Alzheimer's Disease* 57: 45–51.

Isuru A, Rodrigo A, Wijesinghe C, et al. (2017) A randomized, double-blind, placebo-controlled trial on the role of preemptive analgesia with acetaminophen [paracetamol] in reducing headache following electroconvulsive therapy [ECT]. *BMC Psychiatry* 17: 275.

Jelovac A, Kolshus E and McLoughlin DM (2013) Relapse following successful electroconvulsive therapy for major depression: A meta-analysis. *Neuropsychopharmacology* 38: 2467–2474.

Kellner C, Knapp R and Petrides G (2006) Continuation electroconvulsive therapy vs pharmacotherapy for relapse prevention in major depression: A multisite study from the Consortium for Research in Electroconvulsive Therapy (CORE). *Archives of General Psychiatry* 63: 1337–1344.

Kellner CH, Husain MM, Knapp RG, et al. (2016) A novel strategy for continuation ECT in geriatric depression: Phase 2 of the PRIDE study. *American Journal of Psychiatry* 173: 1110–1118.

Kellner CH, Knapp R, Husain MM, et al. (2010) Bifrontal, bitemporal and right unilateral electrode placement in ECT: Randomised trial. *The British Journal of Psychiatry* 196: 226–234.

Kolshus E, Jelovac A and McLoughlin D (2017) Bitemporal v. high-dose right unilateral electroconvulsive therapy for depression: A systematic review and meta-analysis of randomized controlled trials. *Psychological Medicine* 47: 518–530.

Lakshmana R, Hiscock R, Galbally M, et al. (2014) Electroconvulsive therapy in pregnancy. In: Galbally M, Snellen M and Lewis A (eds)

Psychopharmacology and Pregnancy: Treatment Efficacy, Risks, and Guidelines. Berlin; Heidelberg: Springer, pp. 209–223.

Lally J, Tully J, Robertson D, et al. (2016) Augmentation of clozapine with electroconvulsive therapy in treatment resistant schizophrenia: A systematic review and meta-analysis. *Schizophrenia Research* 171: 215–224.

Leiknes K, Cooke M, von-Schweder L, et al. (2015) Electroconvulsive therapy during pregnancy: A systematic review of case studies. *Archives of Womens Mental Health* 18: 1–39.

Leung M, Hollander Y and Brown GR (2003) Pretreatment with ibuprofen to prevent electroconvulsive therapy-induced headache. *The Journal of Clinical Psychiatry* 64: 551–553.

Li D (2017) Significant treatment effect of add-on ketamine anesthesia in electroconvulsive therapy in depressive patients: A meta-analysis. *European Neuropsychopharmacology* 27: 29–41.

Li T-C, Shiah I-S, Sun C-J, et al. (2011) Mirtazapine relieves post-electroconvulsive therapy headaches and nausea: A case series and review of the literature. *The Journal of ECT* 27: 165–167.

Lima NN, Nascimento VB, Peixoto JA, et al. (2013) Electroconvulsive therapy use in adolescents: A systematic review. *Annals of General Psychiatry* 12: 17.

Loo CK, Garfield JB, Katalinic N, et al. (2013) Speed of response in ultrabrief and brief pulse width right unilateral ECT. *International Journal of Neuropsychopharmacology* 16: 755–761.

Loo CK, Katalinic N, Mitchell PB, et al. (2011) Physical treatments for bipolar disorder: A review of electroconvulsive therapy, stereotactic surgery and other brain stimulation techniques. *Journal of Affective Disorders* 132: 1–13.

Loo CK, Katalinic N, Smith DJ, et al. (2015) A randomized controlled trial of brief and ultrabrief pulse right unilateral electroconvulsive therapy. *International Journal of Neuropsychopharmacology* 18: pyu045.

Loo CK, Sainsbury K and Sheehan P (2008) A comparison of RUL ultrabrief pulse (0.3 ms) ECT and standard RUL ECT. *International Journal of Neuropsychopharmacology* 11: 883–980.

McCall WV, Lisanby SH, Rosenquist PB, et al. (2017) Effects of a right unilateral ultrabrief pulse electroconvulsive therapy course on health related quality of life in elderly depressed patients. *Journal of Affective Disorders* 209: 39–45.

McGirr A, Berlim MT, Bond DJ, et al. (2017) Adjunctive ketamine in electroconvulsive therapy: Updated systematic review and meta-analysis. *British Journal of Psychiatry* 210: 403–407.

Malhi GS, Bassett D, Boyce P, et al. (2015) Royal Australian and New Zealand College of Psychiatrists clinical practice guidelines for mood disorders. *Australian & New Zealand Journal of Psychiatry* 49: 1087–1206.

Manjola U (2015) Dementia, agitation, and aggression: The role of electroconvulsive therapy. Special report. *Psychiatric Times*. Available at: www.psychiatrictimes.com/dementia-agitation-and-aggression-role-electroconvulsive-therapy

Martin DM, Gálvez V and Loo CK (2015) Predicting retrograde autobiographical memory changes following electroconvulsive therapy: Relationships between individual, treatment, and early clinical factors. *International Journal of Neuropsychopharmacology* 18: 67.

Martin DM, Gálvez V, Lauf S, et al. (2017) The clinical alliance and research in electroconvulsive therapy network: An Australian initiative for improving service delivery of electroconvulsive therapy. *Journal of ECT* 34: 7–13.

Martin DM, Katalinic N, Ingram A, et al. (2013) A new early cognitive screening measure to detect cognitive side-effects of electroconvulsive therapy? *Journal of Psychiatric Research* 47: 1967–1974.

Martin DM, Wong A, Kumar DR, et al. (2018) Validation of the 10-item orientation questionnaire: A new tool for monitoring post–electroconvulsive therapy disorientation. *Journal of ECT* 34: 21–25.

Mayer P, Bray A, Fernandes J, et al. (2010) Impact of hyperventilation on stimulus efficiency during the early phase of an electroconvulsive therapy course: A randomized double-blind study. *Journal of ECT* 26: 91–94.

Mayur P, Byth K and Harris A (2013) Acute antidepressant effects of right unilateral ultra-brief ECT: A double-blind randomised controlled trial. *Journal of Affective Disorders* 149: 426–429.

Miller L (1994) Use of electroconvulsive therapy during pregnancy. *Hospital & Community Psychiatry* 45: 445–450.

Nasreddine ZS, Phillips NA, Bédirian V, et al. (2005) The Montreal Cognitive Assessment, MoCA: A brief screening tool for mild cognitive impairment. *Journal of the American Geriatrics Society* 53: 695–699.

Petrides G, Malur C and Braga R (2015) Electroconvulsive therapy augmentation in clozapine-resistant schizophrenia: A prospective, randomized study. *The American Journal of Psychiatry* 172: 52–58.

Phutane V, Thirthalli J and Muralidharan K (2013) Double-blind randomized controlled study showing symptomatic and cognitive superiority of bifrontal over bitemporal electrode placement during electroconvulsive therapy for schizophrenia. *Brain Stimulation* 6: 210–217.

Prudic J, Olfson M, Marcus SC, et al. (2004) Effectiveness of electroconvulsive therapy in community settings. *Biological Psychiatry* 55: 301–312.

RANZCP (2012) *Royal Australian and New Zealand College of Psychiatrists. Electroconvulsive Therapy Entrustable Professional Activity (EPA)*. Melbourne, VIC, Australia: RANZCP.

RANZCP (2014) *Royal Australian and New Zealand College of Psychiatrists (RANZCP). Position Statement 62: Consumer, Family/whānau and Carer Engagement*. Melbourne, VIC, Australia: RANZCP.

RANZCP (2017a) *Royal Australian and New Zealand College of Psychiatrists. Comparison Table: Regulation of ECT in Australian and New Zealand Mental Health Acts*. Melbourne, VIC, Australia: RANZCP.

RANZCP (2017b) *Royal Australian and New Zealand College of Psychiatrists. Special Provisions Governing Informed Consent for ECT*. Melbourne, VIC, Australia: RANZCP.

RANZCP (2017c) *Royal Australia and New Zealand College of Psychiatrists. Your Health in Mind: Electroconvulsive Therapy*. Melbourne, VIC, Australia: RANZCP.

Sackeim H, Prudic J and Nobler M (2008) Effects of pulse width and electrode placement on the efficacy and cognitive effects of electroconvulsive therapy. *Brain Stimulation* 1: 71–83.

Sackeim H, Prudic J, Fuller R, et al. (2007) The cognitive effects of electroconvulsive therapy in community settings. *Neuropsychopharmacology* 32: 244–254.

Sackeim HA, Dillingham EM, Prudic J, et al. (2009) Effect of concomitant pharmacotherapy on electroconvulsive therapy outcomes: Short-term efficacy and adverse effects. *Archives of General Psychiatry* 66: 729–737.

Sackeim HA, Haskett RF, Mulsant BH, et al. (2001) Continuation pharmacotherapy in the prevention of relapse following electroconvulsive therapy: A randomized controlled trial. *JAMA* 285: 1299–1307.

Semkovska M and McLoughlin D (2010) Objective cognitive performance associated with electroconvulsive therapy for depression: A systematic review and meta-analysis. *Biological Psychiatry* 68: 568–577.

Semkovska M, Landau S, Dunne R, et al. (2016) Bitemporal versus high-dose unilateral twice-weekly electroconvulsive therapy for depression (EFFECT-Dep): A pragmatic, randomized, non-inferiority trial. *American Journal of Psychiatry* 173: 408–417.

Short B, Fong J, Galvez V, et al. (2017) Side-effects associated with ketamine use in depression: A systematic review. *The Lancet Psychiatry* 5: 65–78.

Sienaert P, Vansteelandt K, Demyttenaere K, et al. (2009) Randomized comparison of ultra-brief bifrontal and unilateral electroconvulsive therapy for major depression: Clinical efficacy. *Journal of Affective Disorders* 116: 106–112.

Sienaert P, Vansteelandt K, Demyttenaere K, et al. (2010) Randomized comparison of ultra-brief bifrontal and unilateral electroconvulsive therapy for major depression: Cognitive side-effects. *Journal of Affective Disorders* 122: 60–67.

Sinha P, Goyal P and Andrade C (2017) A meta-review of the safety of electroconvulsive therapy in pregnancy. *Journal of ECT* 33: 81–88.

Spaans H, Verwijk E and Comijs H (2013) Efficacy and cognitive side effects after brief pulse and ultrabrief pulse right unilateral electroconvulsive therapy for major depression: A randomized, double-blind, controlled study. *Journal of Clinical Psychiatry* 74: e1029–e1036.

Stewart P, Loo CK, MacPherson R, et al. (2011) The effect of electrode placement and pulsewidth on asystole and bradycardia during the electroconvulsive therapy stimulus. *International Journal of Neuropsychopharmacology* 14: 585–594.

Surya S, Rosenquist PB and McCall WV (2015) Electroconvulsive therapy: Introduction and technical aspects. In: Hamani C, Holtzheimer P, Lozano AM and et al. (eds) *Neuromodulation in Psychiatry*. New York: Wiley, pp. 429–454.

Tang VM, Pasricha AN, Blumberger DM, et al. (2017) Should benzodiazepines and anticonvulsants be used during electroconvulsive therapy?: A case study and literature review. *The Journal of ECT* 33: 237–242.

Tew JD, Mulsant BH, Haskett RF, et al. (2007) Relapse during continuation pharmacotherapy after acute response to ECT: A comparison of usual care versus protocolized treatment. *Annals of Clinical Psychiatry* 19: 1–4.

Tharyan P and Adams C (2005) Electroconvulsive therapy for schizophrenia. *The Cochrane Database of Systematic Reviews* 2: CD00007.

Thirthalli J, Harish T and Gangadhar BN (2011) A prospective comparative study of interaction between lithium and modified electroconvulsive therapy. *The World Journal of Biological Psychiatry* 12: 149–155.

Tor P, Bautovich A, Wang MJ, et al. (2015) A systematic review and meta-analysis of brief versus ultrabrief right unilateral electroconvulsive therapy for depression. *Journal of Clinical Psychiatry* 76: 1092–1098.

Verwijk E, Comijs H and Kok R (2012) Neurocognitive effects after brief pulse and ultrabrief pulse unilateral electroconvulsive therapy for major depression: A review. *Journal of Affective Disorders* 140: 233–243.

Walter G and Rey J (2003) Has the practice and outcome of ECT in young persons changed? Findings from a whole population study. *Journal of ECT* 19: 84–87.

Weiss A (2018) *The Electroconvulsive Therapy Workbook: Clinical Applications*. London: Taylor & Francis Ltd.