

<b>Institution: Queen Mary University of London</b>		
<b>Unit of Assessment: 11</b>		
<b>Title of case study: Improving mental healthcare through tools for effective clinical communication</b>		
<b>Period when the underpinning research was undertaken: 2009-2018</b>		
<b>Details of staff conducting the underpinning research from the submitting unit:</b>		
<b>Name(s):</b>	<b>Role(s) (e.g. job title):</b>	<b>Period(s) employed by submitting HEI:</b>
Matthew Purver	Reader	2009-present
Patrick Healey	Professor	1998-present
Rose McCabe	Senior Lecturer	Oct 2007 to Sep 2013
Christine Howes	Postdoctoral Research Assistant (PDRA)	2012-2014
Julian Hough	PDRA / Lecturer	2012-present
<b>Period when the claimed impact occurred: 2014-31 Jul 2020</b>		
<b>Is this case study continued from a case study submitted in 2014? N</b>		
<p><b>1. Summary of the impact</b> (indicative maximum 100 words)</p> <p>Treatment outcomes for mental illness are known to depend on the quality of doctor-patient communication. Research in the Cognitive Science Group at Queen Mary's School of Electronic Engineering and Computer Sciences (EECS) has used computational methods to analyse and improve clinical communication and outcomes. Since 2014, the team's novel communication training programme for clinicians for psychosis treatment (TEMPO) has been used by 12 NHS Trusts across the UK and 43 international institutions. As a result of the training, psychiatrists are six times more engaged with their patients. Since 2016, the team's communication support tools (DIALOG+) are now part of the NHS Outcomes Programme, and recommended for use with all early intervention teams in England (&gt;18,600 patients) and all patients receiving mental health services in London (&gt;100,000 patients). When DIALOG+ is repeatedly used over six months, it has been shown to improve patients' quality of life and reduce treatment costs. The team's automatic diagnosis and prediction methods have led to a patent and ongoing commercial use by IESO Digital Health Ltd in their online cognitive behavioural therapy (CBT) treatment for patients with depression and anxiety, which has treated approximately 1,000,000 patients to date. An application for the patent's extension to the US was filed in 2017.</p>		
<p><b>2. Underpinning research</b> (indicative maximum 500 words)</p> <p>Mental illness is 'the biggest single cause of misery in UK society,' affecting one in four people, with an economic and social cost of GBP105,000,000,000. Yet, only 25% of sufferers receive treatment (Layard reports 2006, 2012). Successive UK governments have prioritised mental healthcare, for example 2011's cross-government outcomes strategy 'No Health Without Mental Health' and 2016's GBP1,000,000,000 investment in mental health services. Health communication is a critical issue in mental health care. Every 36 hours, the NHS deals with over a million patients and each of these contacts generates multiple spoken interactions between patients and care teams and within care teams. Communication failure is both common and frequently safety critical.</p> <p>Research in the Queen Mary Cognitive Science Group focuses on the basic mechanisms that underpin human-human communication, in particular the processes through which people detect and recover from miscommunication [3.1]. Their research into communication and miscommunication in clinical settings has provided new insights into the critical mechanisms [3.2, 3.4, 3.5] and new empirical and computational methods, which can identify, measure and support these processes through technological interventions [3.1, 3.3, 3.5]. This research has been in collaboration with Queen Mary's School of Medicine and Dentistry, the University of Exeter's Medical School (after McCabe moved from Queen Mary to Exeter) and more recently the University of Warwick (Liakata, now at Queen Mary). This has led to a number of practical applications now in use in mental healthcare in the UK and beyond.</p> <p>Specifically the team has accomplished the following:</p>		

**Developed a new communication training method for clinicians (TEMPO) [EQR. 1] [3.6]**

From the team's basic research findings on the effectiveness of particular conversational strategies in clinical interactions, the researchers developed the TEMPO training procedure for clinicians interacting with patients with psychosis. TEMPO uses 'hearing voices' simulations to help clinicians understand how it feels to experience psychosis, followed by sessions using specific interaction techniques that target improvements in clinician's engagement with each patient and their experience. This leads to significantly improved communication [3.6].

**Developed new tools to support structured patient-clinician interactions and information sharing in care teams (DIALOG+) [EQR. 2] [3.4]**

This novel tablet-based mobile application delivers assessment, planning, intervention and evaluation using a single integrated graphical user interface. Designed by Healey, in collaboration with Queen Mary's School of Medicine and Dentistry, the application structures conversation in patient-clinician meetings around a series of questions designed to elicit patient's views on their quality of life and treatment and ensure follow-up. Using DIALOG+ in routine meetings leads to better quality of life (with effect size at least as large as specialised interventions such as cognitive behavioural therapy, CBT), reduced symptoms, better social outcomes, and reduced treatment costs, as tested in randomised control trials in 6 European countries [3.7].

**Developed new computational methods to analyse communication and predict clinical outcomes [3.1, 3.2, 3.3]**

The Predicting Patient Adherence to Treatment (PPAT) project [EQR. 3] showed that specific features of language in patient-clinician interaction (for example, ways of clarifying the other person's talk) can predict a crucial outcome in schizophrenia treatment and patient adherence to their programme of treatment [3.2], and that these features could be detected automatically using natural language processing (NLP) [3.1]. The Analysing Online Therapy Dialogue [EQR. 4] then showed that this NLP approach could be extended to treatment for depression and anxiety to discover features in the language used in CBT, which can help automate diagnosis and predict recovery [3.3]. In collaboration with IESO Digital Health Ltd, this was developed and applied to their online typed service for cognitive behavioural therapy for depression and anxiety (available via the NHS).

**3. References to the research** (indicative maximum of six references)

[3.1] Purver, M., Hough, J. & Howes, C. (2018). Computational models of miscommunication phenomena. *Topics in cognitive science*, 10(2), 425-451. <https://doi.org/10.1111/tops.12324>

[3.2] McCabe, R., Healey, P. G. T., Priebe, S. et al. (2013). Shared understanding in psychiatrist-patient communication: association with treatment adherence in schizophrenia. *Patient Educ Couns*, 93 (1), 73-79. <https://doi.org/10.1016/j.pec.2013.05.015>

[3.3] Howes, C., Purver, M. & McCabe, R. (2014). Linguistic indicators of severity and progress in online text-based therapy for depression. *Proceedings of the ACL 2014 workshop on Computational Linguistics and Clinical Psychology (CLCP)*. <http://dx.doi.org/10.3115/v1/W14-3202>

[3.4] Themistocleous, S., McCabe, R., Rees, N., Hassan, I., Healey, P. G. T. & Priebe, S. (2009). Establishing mutual understanding in interaction: an analysis of conversational repair in psychiatric consultations. *Communication and Medicine*, 6 (2), 165-176. <https://doi.org/10.1558/cam.v6i2.165>

[3.5] McCabe, R. & Healey, P. G. T. (2018). Miscommunication in doctor-patient communication. *Topics in cognitive science*, 10.2, 409-424. <https://doi.org/10.1111/tops.12337>

[3.6] McCabe, R., John, P., Dooley, J., Healey, P., Cushing, A., Kingdon, D., Bremner, S. & Priebe, S. (2016). Training to enhance psychiatrist communication with patients with psychosis (TEMPO): cluster randomised controlled trial. *The British Journal of Psychiatry*, 209(6), 517-524. <https://doi.org/10.1192/bjp.bp.115.179499>

[3.7] Priebe, S., Golden, E., Kingdon, D., Omer, S., Walsh, S., Katevas, K., McCrone, P., Eldridge, S. & McCabe, R. (2017). Effective patient-clinician interaction to improve treatment outcomes for patients with psychosis: a mixed methods design (DIALOG+). *Health Technology Assessment Programme Grants Appl Res*, 5(6). <https://doi.org/10.3310/pgfar05060>

**Evidence of quality of the research:**

[EQR. 1] Healey, P. (2010-2013). TEMPO [PB-PG-0408-16279]. *NIHR*. Research for Patient Benefit. GBP249,000.

[EQR. 2] Healey, P. (2010-2015). DIALOG+ [RP-PG-0108-10023]. *NIHR*. Research for Patient Benefit. GBP1,000,000.

[EQR. 3] Purver, M. [Principal Investigator]. (2012). Predicting Patient Adherence to Treatment [EP/J501360/1]. *EPSRC*. IAA Pump-Priming. GBP53,000.

[EQR. 4] Purver, M. [Principal Investigator] (2013-2015). Analysing Online Therapy Dialogue. *EPSRC*. Impact Acceleration Account. GBP10,000.

**4. Details of the impact** (indicative maximum 750 words)

**Improving patient health outcomes and quality of life**

In real-world clinical trials with patients, the team's TEMPO training procedure, DIALOG+ mobile app and natural language processing methods have all been shown effective at improving health outcomes, and are being delivered in public health services. As Dr Frank Rohricht, Medical Director for Research/Innovation and Medical Education at the East London NHS Foundation Trust says, "Service user and staff interviews indicate that all stakeholders are reporting improvements in the way they can engage in therapeutic relationships and provide recovery oriented meaningful care in line with service user preferences" [5.1] after integrating DIALOG+ into a new Care Programme Approach.

*The TEMPO training*

According to Dr. Michelle Gilmore, consultant psychiatrist at Sunshine Coast University Hospital, Australia the training has taught psychiatrists and medical students "how to assess and build rapport with patients presenting with psychosis. This is crucial for engaging these patients in treatment, many of whom do not consider themselves to be unwell or in need of treatment. When doctors can engage these patients in treatment, they are much less likely to relapse and end up back in hospital" [5.2]. The TEMPO training improved communication considerably, with psychiatrists six times more engaged with their patients in the clinic, and both patients and psychiatrists rating the therapeutic relationship more positively. Visit length did not increase [3.6]. Clinicians reported a change in their perspective on how patients feel the need to talk about and make sense of their experiences: "I felt tempted to discuss voices with somebody; I now understand the patient's need to talk about the voices."; "Now, I understand why patients want to talk about it, as it would be really difficult to experience this and to just block it out and contain it, even though it might seem repetitive from the psychiatrists' point of view." and "I acknowledge it more and have more admiration for patients living with this" [3.6]. Based on this success, TEMPO is now being delivered by 23 NHS Trusts nationally and internationally at 41 institutions to over 600 clinicians treating over 550 patients/week [5.3].

*The DIALOG+ mobile app*

Repeated use of DIALOG+ over six months [3.7]:

- Improves Patients' quality of life (with effect size at least as large as specialised interventions such as cognitive behavioural therapy)
- Reduces symptoms
- Has better outcomes for independent living, work and social relationships
- Reduces treatment costs to approximately GBP1,300 per patient per year, resulting in approximately GBP10,400 every year in East London NHS Foundation Trust alone [5.4]

Since 2015, DIALOG+ has been in routine use across all secondary care patients in east London, Luton and Bedfordshire, Norfolk and Suffolk and across all health boards in Wales (currently >8,000 patients). The app has been downloaded over 700 times and has been used in over 5,000 sessions (note that downloads are by care teams, therefore, numbers are not comparable with mass-market apps for individuals). Since 2016, DIALOG+ use has been recommended for the mandatory evaluation of all early intervention teams in England (>5,000 patients) and forms part of the NHS Outcomes Programme. DIALOG+ is recommended for all patients receiving mental health services in London (>100,000 patients) [5.5]. Internationally, the app has been translated into 17 languages and is available on both Apple and Android platforms. The intervention has been implemented and/or tested in more than 18 countries.

#### *The natural language processing methods*

The natural language processing methods developed in [EQR. 4], a collaboration with IESO Digital Health Ltd, were applied to IESO's real-world clinical data of cognitive behavioural therapy (CBT) treatment for patients with depression and anxiety; they proved effective for automatic diagnosis of condition severity, prediction of recovery at end of treatment, and detection of therapist quality [5.6]. They are now used in IESO's online CBT service, available via the NHS. To date, approximately 1,000,000 patients have been treated in the UK and US.



#### **How your online therapy will work**

Online CBT is exactly the same as face-to-face in almost every way - you will work 1:1 with your therapist but the conversation is typed instead of spoken. Research has shown that people are just as likely to recover this way, and many people have said they found it less daunting and easier to be open. Online CBT is delivered securely through our online therapy platform. At the time of your appointment, you simply log in and speak to your therapist by typing back and forth. Typed conversation removes the pressure of having a face-to-face conversation, and can allow you to express your true, inner feelings. Sessions usually take place once a week and last up to 60 minutes.

Figure 1: Screen capture from the IESO ([www.iesohealth.com](http://www.iesohealth.com)) Copyright [2020] by IESO.

#### **Improving business performance through new products/processes**

A patent to protect the natural language processing (NLP) methods developed jointly between Queen Mary and IESO was jointly filed in 2015 (application PCT/GB2014/053311), with an application for extension to the USA filed in 2017 (application 15/524,756). IESO purchased the rights to the NLP methods in 2017 and have made use of these methods, which are central to their business. Queen Mary acted as consultants to help them recruit NLP staff specifically to extend and build on the techniques developed with Queen Mary (initial hire 2017 Dr Valentin Tablan, now Senior VP heading their 10-strong Artificial Intelligence team). They have built on the NLP techniques and developed NLP into one of their key commercial offerings, which has now reached approximately 1,000,000 patients as it is "a very important tool in the process of building technology to support the prevention, diagnosis, and treatment of mental health conditions" [5.7]. IESO has shown that this is effective at predicting outcomes in CBT in a large-scale study [5.6].

#### **5. Sources to corroborate the impact** (indicative maximum of 10 references)

[5.1] Rohricht, F. Medical Director for Research/Innovation and Medical Education. *East London NHS Foundation Trust* (testimonial letter, 24 October 2018). [Corroborator 1]

[5.2] Gilmore, M. Consultant Psychiatrist. *Sunshine Coast University Hospital* (testimonial letter, 19 August 2020). [Corroborator 2]

[5.3] University of Exeter, College of Medicine and Health. *TEMPO Manual for Facilitators: Download report*. <https://medicine.exeter.ac.uk/tempo/trainingmanual/>. 22 October 2020.

[5.4] Priebe, P., Golden, E., Kingdon, D., Omer, S., Walsh, S., Katevas, K., McCrone, P., Eldridge, S. & McCabe, R. (2017). Effective patient-clinician interaction to improve treatment outcomes for patients with psychosis: a mixed-methods design. *Programme Grants for Applied Research*, 5 (6). <https://doi.org/10.3310/pgfar05060>

[5.5] Bhattacharya, R. Consultant Psychiatrist, Associate Clinical Director (Tower Hamlets) and Clinical Lead in Payment and Outcomes. *East London Foundation Trust* (testimonial letter, 9 November 2018). [Corroborator 3]

[5.6] Ewbank, M. P., Cummins, R., Tablan, V., Bateup, S., Catarino, A., Martin, A. J. & Blackwell, A. D. (2020). Quantifying the association between psychotherapy content and clinical outcomes using deep learning. *JAMA Psychiatry*, 77(1), 35-43. doi:10.1001/jamapsychiatry.2019.2664

[5.7] Tablan, V. Chief AI Officer. *IESO Digital Health* (testimonial letter 24 April 2020). [Corroborator 4]