

Reaching patients with an orphan disease – Tuberous Sclerosis Complex (TSC)

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Background:

- Tuberous sclerosis complex (TSC) is characterised by benign hamartomatous growths in multiple organs including brain, kidneys, chest and skin, caused by pathogenic *TSC1* or *TSC2* gene mutations.
- Patients present initially at any age from child to adulthood, and to one of many different specialists.
- Improved understanding of the natural history and molecular biology of TSC has led directly to new treatment options, and new recommendations for patient surveillance.
- Care remains neither co-ordinated nor comprehensive for most patients[1].
- The St Georges/Brighton TSC clinic has a catchment population of 16-20 million, and was founded 25 years ago to address this.
- Patients and families have complex medical and social needs, and coordination of care is challenging.
- Core physicians are from genetics, nephrology and neurology, networked with physicians from all other necessary disciplines.
- A clinical nurse specialist (CNS) coordinates patients' care according to the International Guidelines, and offers telephone support and advice.
- There is one TSC-genetics and one TSC-renal clinic each month.

TSC Service Innovations

Innovation	Role
1. A TSC-Clinic database	To track new referrals, clinical outcomes, and flag patients requiring surveillance
2. A central TSC-referral email	To receive electronic referrals; patient contacts and for clinicians to contact for advice
3. A new St George's TSC-Clinic Webpage	To outline the clinics, referral mechanisms and key staff
4. A new TSC-Renal clinic	to support patients requiring mTOR inhibitor treatment
5. Quarterly internal multi-disciplinary meeting	including clinicians external to St George's to discuss patient management plans
6. UK-TSA representative attends the clinic	A patient organisation representative to directly support patients and families

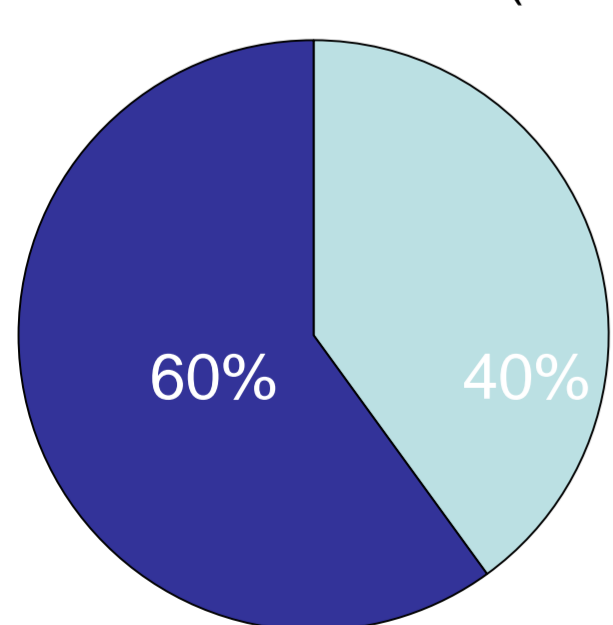
Table 1: TSC Service Innovations at the St George's TSC clinic

Study Design:

- Data from TSC-Clinic patients attending between Sept 2016-Aug 2017 were analysed, to determine referral pattern and patient satisfaction.

Results 1:

- 120 patients were booked into the clinic; of which 48 (40%) new referrals and 72 (60%) follow-up patients were seen (Figure 1)



■ New Referrals
■ Follow-up

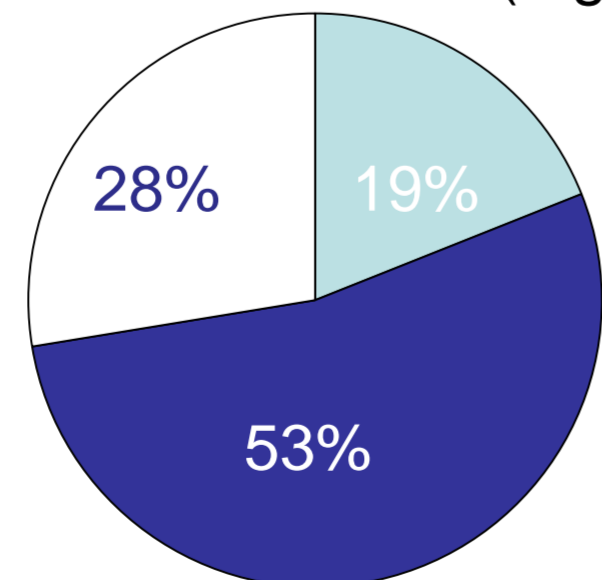


Figure 2: TSC-Clinic: Sources of new referral

- Of 58 new referrals received (Figure 2),
 - 11 (19%) were written primary care referrals,
 - 31 (53%) were referred by letter from consultants
 - 16 (28%) were received via TSCreferrals email (GP and consultant)

Results 2:

- The TAND checklist is administered in around 75% of patients by a visiting psychiatrist for patients where indicated, but they are not always available for the whole of every clinic.
- 22 patients had commenced mTOR inhibitor therapy; 6 awaited a start date to commence therapy.
- All patients commencing therapy require surveillance scans (MRI or CT) at baseline and at 6 months after commencing therapy to evaluate the therapeutic response;
- Around 20% require general anaesthetic for imaging scans.

Core Services	Role
1. Genetic testing and counselling	<ul style="list-style-type: none"> • Offer genetic testing for family members of TSC patients, • Cascade genetic testing to identify asymptomatic disease in parents and relatives, & stratify risk of developing TSC manifestations. • Prenatal & pre-implantation genetic diagnosis.
2. Neurology & Neuroradiology	<ul style="list-style-type: none"> • Access to paediatric & adult neurology services with specific epilepsy expertise, including epilepsy and learning disability nurses. • Access to Neurophysiological tests including routine electroencephalogram (EEG) for patients with suspected or known seizure activity, and video-telemetry. • Access to Neuroradiological investigations: Baseline brain MRI (including MRI under general anaesthesia where required): children and young adults with TSC should have a surveillance MRI every 2–3 years.
3. Nephrology, Urology, General & Interventional Radiology	<ul style="list-style-type: none"> • Access to paediatric & adult nephrology, urology and interventional radiology services. • Radiological monitoring should include baseline & 2-3 yearly surveillance MRI, (including under general anaesthesia where required), increased to annual renal imaging if lesions are present. • MRI is the optimal renal imaging modality; CT or ultrasound may be acceptable alternatives in some circumstances.
4. Clinical Psychology, Psychiatry and Developmental Paediatrics	<ul style="list-style-type: none"> • Assess and diagnose intellectual, behavioural and psychiatric conditions associated with TSC. • Monitoring should include baseline evaluation of cognition, regular screening for TAND (or more frequently if required), and comprehensive formal evaluation of TAND at key developmental milestones²²

Table 2: Core Services Essential for a TSC 'Hub' Clinic

Results 3:

- 77/123 patients (62.6%) completed a patient experience questionnaire
- 98.7% (76/77) of patients preferred to be seen at St. George's Hospital, the exception preferring local follow-up has a recognised travel phobia.
- 100% of patients were given a treatment plan;
- 100% were pleased with the outcome of the appointment.

Conclusions:

- Systematic and comprehensive care can be markedly improved by a well co-ordinated multidisciplinary clinic along a 'Hub and Spoke' model, providing or coordinating access to 'Core' (Table 2), and additional services for this group of patients with complex physical and psychological needs.
- More resources are required to complete the TAND checklist for every patient.
- Obtaining sufficient resources for MRI and CT imaging under general anaesthetic is challenging.

Future Work:

- To support and promote regional network follow-up, reduce patient travel costs, inconvenience and promote well-being, without compromising quality of outpatient care, home or local delivery for mTOR inhibitor medication & virtual clinics are under trial

References:

1. J.C. Kingswood et al. The economic burden of tuberous sclerosis complex in the UK: A retrospective cohort study in the Clinical Practice Research Datalink, Journal of Medical Economics (2016), 19:11, 1087-1098.