Supplemental Material

Data S1.

Supplemental Materials and Methods

Survey Methodology

The aim of the survey was to determine their practice in the treatment of Fontan patients with PAH therapies, including prescription patterns, perceived indications, risks and contraindications. The study population included physicians specializing in CHD or PH, working in the UK within designated PH and tertiary CHD services. Demographic and practice characteristics were collected. The survey questions were designed by the CHAMPION Steering Committee, a panel of 5 experts in PH and CHD – see **Figure S1** for survey questions. The survey was electronically distributed using professional online survey software (SurveyMonkey, Paolo Alto, California, USA). An introductory email, followed by 3 reminder emails, were sent to survey participants. All responses were anonymized.

Table S1. Summary of indications of PAH therapies in Fontan patients from expert survey by class of recommendation.

Class of recommendation	Indications selected by experts (count)
Class I ("is recommended")	Fluid overload refractory to diuretic therapy (1) Worsening cyanosis in a patient with a fenestration (1) Decreasing exercise capacity (1)
Class IIa ("should be considered")	PLE refractory to other therapy (8) Fluid overload refractory to diuretic therapy (6) Decreasing exercise capacity (4) Multiple 'heart failure' admissions (4) Complications following TCPC conversion surgery (3)
Class IIb ("may be considered")	PLE refractory to other therapy (7) New fluid overload (7) Fluid overload refractory to diuretic therapy (7) Decreasing exercise capacity (7) Multiple 'heart failure' admissions (5)
Class III ("is not recommended")	Significant systemic ventricular dysfunction (9) Significant atrioventricular valve regurgitation (6) Hypoplasia of the pulmonary arteries (2)

Figure S1. Survey Questions.

1. Within which region of the UK do you work?
    a. North
    b. Midlands and East
    c. South
    d. London
    e. Scotland
    f. Wales
    g. Northern Ireland
2. What is your sub-specialty (select one or more options)?
    a. Adult congenital cardiologist
    b. Paediatric congenital cardiologist
    c. Pulmonary hypertension specialist
    d. Other (please specify)
3. How many Fontan patients are under the care of your centre?
    a. More than 100
    b. 20-100
    c. Fewer than 20
4. In your clinical practice, in approximately what percentage of Fontan patients does pulmonary arterial hypertension (PAH) therapy play a role?
    a. 0 – 20
    b. 21 – 40
    c. 41 – 60
    d. 61 – 80
    e. 81 – 100

5. Before starting PAH therapies, in approximately what percentage of patients would you perform cardiac catheterisation?
    a. 0 – 20
    b. 21 – 40
    c. 41 – 60
    d. 61 – 80
    e. 81 – 100
6. Please rank the importance of each of the following haemodynamic parameters for patients with a Fontan/total cavo-pulmonary connection (TCPC) when considering PAH therapy (rank 1 – 4, additional “not important” option):
    a. Pulmonary arterial pressures / pressures in Fontan circuit
    b. Pulmonary vascular resistance by Fick
    c. Pulmonary vascular resistance by hybrid MRI
    d. Systemic ventricular end-diastolic pressure / pulmonary arterial wedge pressure
7. Please indicate the strength of each of the following possible indications for PAH therapies in a teenage or adult Fontan patient (options: No, Weak, Strong)
    a. Decreasing exercise capacity
    b. New fluid overload\Fluid overload refractory to diuretic therapy
    c. Two or more ‘heart failure’ admissions over the past year
    d. New diagnosis of protein losing enteropathy (PLE)
    e. PLE refractory to other therapy
    f. Fontan-associated liver disease
    g. Complications following TCPC conversion surgery
    h. Worsening cyanosis in a patient with a fenestration
    i. Other (please specify)

8. Please indicate the strength of each of the following possible contraindications to the initiation of PAH therapy in a Fontan patient (options: No, Weak, Strong)
    a. Significant systemic ventricular dysfunction
    b. Significant atrioventricular valve regurgitation
    c. Hypoplasia of the pulmonary arteries
    d. Renal dysfunction
    e. Hepatic congestion
    f. Liver cirrhosis
    g. Other (please specify)
9. Which would you consider as first-line PAH therapy in Fontan patients?
    a. Phosphodiesterase type 5 (PDE-5) inhibitor
    b. Endothelin receptor antagonist (ERA)
    c. Prostacyclin pathway drugs (PGI2 analogue or IP receptor antagonist)
    d. Combination therapy (please specify)
10. Please indicate which of the following would affect your choice of agent for first-line PAH therapy (tick all that apply)
    a. National clinical commissioning policy
    b. Regional or trust-level policy
    c. Liver congestion
    d. History of migraine
    e. Anaemia
    f. Thrombocytopenia
    g. Systemic ventricular or atrio-ventricular valve dysfunction
    h. Other (please specify)

11. Do you think that Fontan patients are at particularly high risk of complications from PAH therapies compared to idiopathic PAH or other congenital heart disease-associated PAH patients?
    a. Yes
    b. No

    Please comment here if you wish to expand on your answer:

    _____

12. Is liver dysfunction of particular concern to you when starting an ERA in a Fontan patient?
    a. Yes
    b. No

    Please comment here if you wish to expand on your answer:

    _____

13. Please indicate which of the following you would consider a treatment end-point for PAH therapy in Fontan patients. Rank all that apply in order of importance (1 for most important) or mark as “not important”:
    a. Improve prognosis
    b. Improve exercise capacity
    c. Improve quality of life
    d. Control heart failure or PLE
    e. Improve resting saturations
14. Please indicate any other aims of therapy you consider important:

    _____

15. Each of the following sentences have the following structure:

    PAH therapy ___ for Fontan patients with ___ (___ indication).

Please use the options below to formulate up to 8 of your own sentences, which reflect your views on PAH therapies in Fontan patients.

The tables below are a reminder of the wording adopted by international guidelines with respect to the level of evidence and the strength of the recommendation of management options.

	Definition	**Suggested wording to use**
Class I	Evidence and/or general agreement that a given treatment or procedure is beneficial, useful, effective.	Is recommended/ is indicated
Class II	Conflicting evidence and/or a divergence of opinion about the usefulness/efficacy of the given treatment or procedure.	
Class IIa	Weight of evidence/opinion is in favour of usefulness/efficacy.	Should be considered
Class IIb	Usefulness/efficacy is less well established by evidence/opinion.	May be considered
Class III	Evidence of general agreement that the given treatment or procedure is not useful/effective, and in some cases may be harmful.	Is not recommended

Level of evidence	**Criteria**
A	Data derived from multiple randomized clinical trials or meta-analyses.

B	Data derived from a single randomized clinical trial or large non-randomised studies.
C	Consensus of opinion of the experts and/or small studies, retrospective studies, registries.

Options following the phrase “PAH therapy” (dropdown box 1):

a. Is recommended/indicated

b. Should be considered

c. May be considered

d. Is not recommended

Options following the phrase “for Fontan patients with” (dropdown box 2):

a. Decreasing exercise capacity

b. New fluid overload

c. Fluid overload refractory to diuretic therapy

d. Multiple ‘heart failure’ admissions

e. PLE refractory to other therapy

f. Complications following TCPC conversion surgery

g. Worsening cyanosis in a patient with fenestration

h. Significant systemic ventricular dysfunction

i. Significant atrio-ventricular valve regurgitation

j. Hypoplasia of the pulmonary arteries

k. Renal dysfunction

l. Hepatic congestion

m. Liver cirrhosis

Options preceding the word "(__ indication)" (dropdown box 3)

a. Class I

b. Class IIa

c. Class IIb

d. Class III

My formulations (up to 8 formulations allowed):

PAH therapy [dropdown box 1] for Fontan patients with [dropdown box 2] ([dropdown box 3] indication).