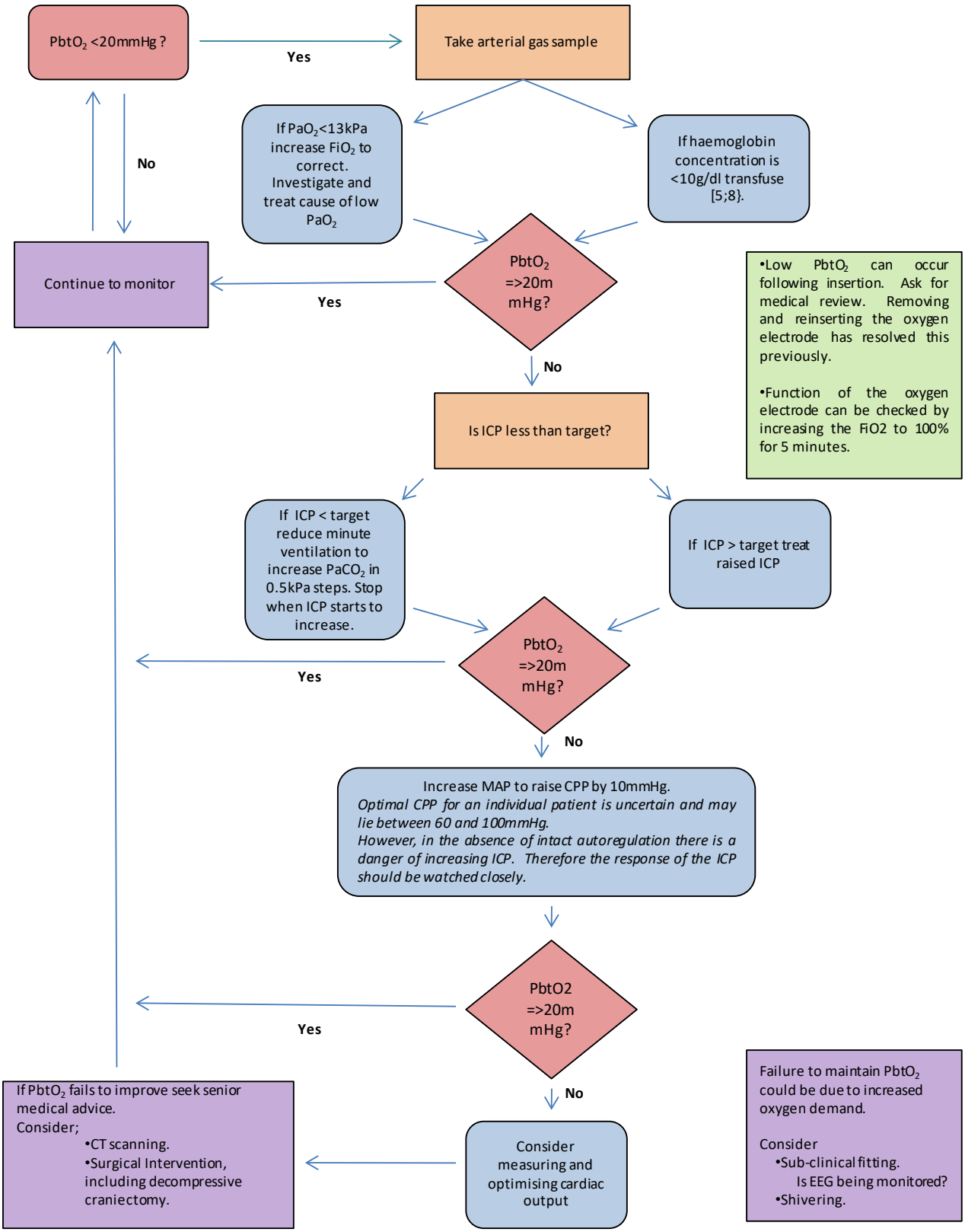
Licox Brain Tissue Oxygen Monitoring Algorithm

We aim to keep $PbtO_2$ => 20mmHg. There are several steps that can be taken to correct a low $PbtO_2$.



Dr Jonathan Rhodes jrhodes1@staffmail.ed.ac.uk 07775 995004

Notes

The integrated Licox brain tissue oxygen tension ($PbtO_2$), temperature and intracranial pressure (ICP) monitoring system should be the standard form of invasive ICP monitoring in patients with traumatic brain injury (TBI).

- The literature and our own clinical experience demonstrate that significant cerebral hypoxia can exist despite achieving guideline values of cerebral perfusion pressure (CPP) and intracranial pressure (ICP) [1;2].

- Although the use of $PbtO_2$ monitoring is not supported by randomised controlled trials there are published studies in which the measurement and correction of $PbtO_2$ is associated with improved outcomes [3-5].

- Episodes of low $PbtO_2$ are associated with death. Early studies demonstrated this association for very low $PbtO_2$ (<6mmHg) [6;7]. More contemporary work suggests that the threshold for concern is much higher, between 15 and 25mmHg [4;5;8].

- Management of CPP, ICP, haemoglobin, fever, fitting and shivering have been used to help correct a low $PbtO_2$ [5;9].

- The Licox system is **NOT** MRI compatible.

Reference List

[1] Gopinath,S.P., Robertson,C.S., Contant,C.F., Hayes,C., Feldman,Z., Narayan,R.K. and Grossman,R.G., Jugular venous desaturation and outcome after head injury, J. Neurol. Neurosurg. Psychiatry., 57 (1994) 717-723.

[2] Stiefel,M.F., Udoetuk,J.D., Spiotta,A.M., Gracias,V.H., Goldberg,A., Maloney-Wilensky,E., Bloom,S. and Le Roux,P.D., Conventional neurocritical care and cerebral oxygenation after traumatic brain injury, J. Neurosurg., 105 (2006) 568-575.

[3] Meixensberger,J., Jaeger,M., Vath,A., Dings,J., Kunze,E. and Roosen,K., Brain tissue oxygen guided treatment supplementing ICP/CPP therapy after traumatic brain injury, J. Neurol. Neurosurg. Psychiatry., 74 (2003) 760-764.

[4] Stiefel,M.F., Spiotta,A., Gracias,V.H., Garuffe,A.M., Guillamondegui,O., Maloney-Wilensky,E., Bloom,S., Grady,M.S. and LeRoux,P.D., Reduced mortality rate in patients with severe traumatic brain injury treated with brain tissue oxygen monitoring, J. Neurosurg., 103 (2005) 805-811.

[5] Spiotta,A.M., Stiefel,M.F., Gracias,V.H., Garuffe,A.M., Kofke,W.A., Maloney-Wilensky,E., Troxel,A.B., Levine,J.M. and Le Roux,P.D., Brain tissue oxygen-directed management and outcome in patients with severe traumatic brain injury, J. Neurosurg., 113 (2010) 571-580.

[6] van Santbrink H., Maas,A.I. and Avezaat,C.J., Continuous monitoring of partial pressure of brain tissue oxygen in patients with severe head injury, Neurosurgery., 38 (1996) 21-31.

[7] Valadka,A.B., Gopinath,S.P., Contant,C.F., Uzura,M. and Robertson,C.S., Relationship of brain tissue PO2 to outcome after severe head injury, Crit Care Med., 26 (1998) 1576-1581.

[8] Smith,M.J., Stiefel,M.F., Magge,S., Frangos,S., Bloom,S., Gracias,V. and Le Roux,P.D., Packed red blood cell transfusion increases local cerebral oxygenation, Crit Care Med., 33 (2005) 1104-1108.

[9] Oddo,M., Frangos,S., Maloney-Wilensky,E., Andrew,K.W., Le Roux,P.D. and Levine,J.M., Effect of shivering on brain tissue oxygenation during induced normothermia in patients with severe brain injury, Neurocrit. Care., 12 (2010) 10-16.

New Patient with Licox - Standard Operating Procedure

1. If the patient has had a LICOX inserted in DCN theatre, get the Licox monitor from the drawer in the lab, and the blue cable and the green cable also in the drawer

2.. Ensure the green card has come with the patient to insert into the monitor, if it has not (its usually stuck in to the patient's notes) then you need to phone DCN theatre to find the card and send it here.

3. Connect the cables (be gentle!). $P_{bt}O_2$ and brain temp will now be displayed.

4. The $P_{bt}O_2$ will often start at a high number >150mmHg and then over the course of 30 mins will settle to its **actual** value.

5. If this value is not > 20mmHg after 30 minutes follow the **LICOX flow chart**. It is on the other side of this card. It is also in the green head injury folder or on the intranet in the TBI guidelines under neuro.

PHONE JONATHAN ANYTIME TO LET HIM KNOW THAT A TBI WITH LICOX IS HERE; he will come in when he can to connect his research laptop.

THERE IS NO NEED TO WAIT FOR JONATHAN IF THE PATIENT ALREADY HAS A LICOX, JUST CONNECT AND START MONITORING.

If the TBI patient admitted has a Camino and not a LICOX phone Jonathan who may come and change it for a LICOX if he is available.