ARTP SLEEP:

S-NEWS

Dreaming of a better night's sleep

In this issue:

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Editor's Welcome

Welcome to the first issue of S-NEWS for 2017. It was great to see many of you at the ARTP annual conference in Belfast earlier this year. The conference had a great location and program, and was definitely enjoyable. What was the greatest thing to see were the packed out sleep sessions all of which were wonderfully informative and very interesting!

For those of you who were unfortunately unable to attend don't worry as we have a packed edition to keep you up to speed. Included are many of the abstracts from candidates who presented posters, including the ARTP Sleep Poster Award winner.

We also have an interesting article from Oliver Dix, Senior Product Manager, at ResMed (UK) Ltd for a different view on the world of Sleep Medicine, as well as updates on sleep in the news and developments from our sleep manufacturers.

I hope you enjoy this edition of S-NEWS magazine. I am hoping as I become more experienced in the role the magazine will evolve. In the coming months I am hoping to draw up a survey to see what you would like to see! If you have any suggestions, or as usual if you have any articles or news to be published, please contact me directly at:

S-NEWS@artp.org.uk

Best wishes,

Alison

Dates for your diary:

- 20-21st June ARTP Advanced Sleep Course, Jury's Inn Birmingham
- 9-13th September ERS International Congress, MiCo Milano Congressi, Milan.
- 7-11 Oct 2017- World Sleep Congress, Prague. Abstract Deadline: 30th June 2017.
- 12-14 October 2017 BSS Biennial Scientific Meeting, Brighton Metropole, Brighton. Abstract Deadline 5th June.
- 25-26th January 2017, ARTP Conference, Brighton Metropole, Brighton. Abstract deadline and further information to follow.

Send your articles to S-NEWS@artp.org.uk

Sleep People:

Oliver Dix, Senior Product Manager, Sleep Solutions & Diagnostics at ResMed (UK)

A View from the 'Dark Side' – an insight into the Commercial side of Sleep Disordered Breathing.

My name is Oliver Dix, Senior Product Manager for Sleep Therapy Solutions & Diagnostics and I have been lucky enough to have spent 8 years with ResMed this month. I feel honoured to be asked as the first "commercial" person to author "Sleep People", and I hope that you will be interested to read my story from the other side of the fence.

I begin my story at the age of 15 where I managed to get a part-time job in a local independent pharmacy which let me see first-hand how patients would seek and listen to clinical advice from the Pharmacist. It also gave me the opportunity to talk to patients and customers, as well as my first taste of 'selling'. I even saw some elements of 'marketing' as the 'drug' companies would usually drop off various materials, adverts, clinical papers and of course 'Post It' notes and pens!

After studying Biology, Chemistry and Physics at A-Level, my BSc Applied Biology course at University involved studying for 3 years plus 1 in industry where I spent my third year working in the Quality Research Microbiology laboratory at Pall Europe in Portsmouth. I had applied to work for Mars Foods, but when the offer of testing Pedigree Pet foods (another arm of their business) versus their namesake chocolate bar I decided to work at Pall! This work experience year proved pivotal in my future career choices. The "norm" was for graduates to choose either laboratory work or medical sales (either Pharmaceutical or Capital equipment); as the thought of spending all my time filling petri dishes and growing cultures didn't appeal, my path naturally led me to join the world of commercial sales and marketing instead, and I haven't looked back!

After many rounds of interviews I was offered a trainee Medical Sales role with a small medical distributor selling patient monitoring, 12-lead ECG/Stress Exercise equipment and portable automated external defibrillators to both NHS Hospitals and GP practices alike. Thankfully things have changed since 1998 and it is so refreshing to hear companies like ResMed who will actually recruit graduates as well as those with experience for such roles. The company I joined only consisted of 4 people when I started, so it was imperative that you were able to do everything from making an appointment, demonstrating the equipment and seeking the signature for purchase orders (typically arriving by post or fax in those days!) through to packing and invoicing, training staff and provide on-going support. These skills were to prove extremely valuable as the company started to grow very quickly - I was then able to make the switch to an Account Manager, before getting promoted to a Regional Manager and then onto Operations Manager all over the course of 9 years. This most recent change led me to move closer to their office in the Cotswold's and is where I still live today near Stratford upon Avon.

My ResMed journey started as an Account Manager in 2009, and for many of the ARTP readership it was the first opportunity to meet as I looked after the Midlands territory. During my first 2 years I was primarily selling and supporting all of the ResMed products, before moving into the UK sleep marketing team to initially look after the mask portfolio. Since then my role has switched towards our Healthcare Informatics Solutions, Sleep therapy devices & Diagnostic portfolio.

As part of the Marketing/Product Management team, I'm lucky to get the opportunity to meet both clinicians and patients and get to see and hear what a difference our solutions can make to their lives. Over the last 6 years I have had the pleasure in taking the lead on launching some of our latest devices, masks, diagnostics and healthcare informatics solutions into what is a very interesting, sometimes challenging but very engaging marketplace that is the NHS. You are all kind enough to give feedback about our products (really key to any marketing role) and I hope that some of you have seen this being incorporated into our latest iterations. It is within marketing that we try to understand on why you use a product, how do you use it and how would you want to use it differently today and in the future? With the collation of your feedback (good and bad!) combined with the dynamics of an ever-changing NHS and global market trends, it is not surprising that the analogy of 'looking into a crystal ball' is often used to describe how we envisage what might be happening in the next 5-7 years!

The world of Sleep & Respiratory is still relatively small when compared to the more traditional healthcare areas. It is young in that CPAP as a therapy is still less than 30 years old and it benefits from being one of the most innovative too - did you know that there are now more patients being monitored remotely for sleep disordered breathing than for anything else in the world?

ARTP and the various manufacturers share many common goals and this close-working relationship was what struck me first was how wonderfully different things were to the 'world of cardiology' I had left behind in 2008. I have thoroughly enjoyed every one of the 7 ARTP Conferences I have attended, it's so encouraging to see how the association looks to improve, guide, support and encourage the younger members and to see them make great strides as each year passes.

Whether we're meeting to talk about our new Mask portfolio, attending a training session on our healthcare informatics platform, discussing the transition from and old to new CPAP device or listening to your insights into what you think a Sleep Respiratory service will be like in 2020 - I look forward to it!

Thank you for this opportunity to share 'my story'. Please feel free to contact me at oliver.dix@resmed.co.uk

ARTP SLEEP POSTER AWARD WINNER:

Comparison of Manual and Automatic Scoring of limited channel sleep studies: Noxturnal Software correlates well with manual scoring in severe OSA.

Cachada, N; Thomas, M., Respiratory Physiology and Sleep Disorders, Heart of England NHS Foundation Trust, Birmingham, UK

Introduction: Demand for diagnostic sleep services is increasing in line with the number of referrals for patients with suspected obstructive sleep apnoea (OSA). Current practice at Birmingham Heartlands Hospital is for a physiologist to manually score limited channel sleep studies with apnoea-hypopnea index (AHI) as the outcome. However, the software used for analysis employs algorithms to automatically score these events as well[1]. Using this auto scoring may reduce the delay between diagnosis and commencing treatment in patients, particularly useful in those with severe OSA.

Aim: To determine the reliability of auto scoring using Noxturnal software compared with manual scoring of sleep studies with AHI≥30/hour (severe OSA)[2].

Methods: The first ten severe OSA cases identified each month during 2015 (n=120) were included in the study. All the subjects received NOX T3 as a type III sleep study during one night. The time frame (lights off and lights on) was adjusted to the same range for both auto and manual scoring[2]. Agreement between the auto and manual measurement of AHI was determined by a Bland-Altman plot and all outcomes were assessed for correlation using the Pearson's correlation coefficient.

Results: The average recording quality was 91.73%. There is a strong correlation in all the events analysed according to the Pearson coefficient. The data was skewed towards higher AHI with manual scoring. Nine studies changed OSA severity category to moderate by using the auto-scoring system.

Table of Statistical results:

n= 120	Average +/- Standard Deviation Manual (M)	Average +/- Standard Deviation Auto (A)	Pearson Correlation (r) M vs A*
AHI	67.25 +/- 24.29	62.70 +/- 25.11	0.9132
Oxygen Desaturation Index (ODI)	67.75 +/- 25.13	61.18 +/- 27.54	0.9421
Obstructive Apnoea (OA)	36.92 +/- 25.86	38.95 +/- 24.53	0.9543
Central Apnoea (CA)	1.71 +/- 3.25	1.74 +/- 2.99	0.9685
Mixed Apnoea (MA)	2.76 +/- 4.73	2.55 +/- 4.57	0.8533
Hypopnea	25.87 +/- 17.31	19.35 +/- 12.84	0.8399

*p<0.0001 for all parameters

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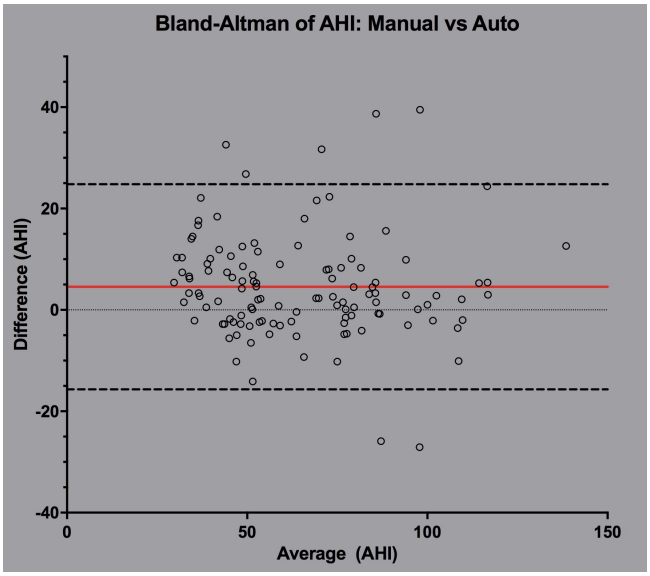


Conclusion: The automatic analysis is a reliable and time efficient tool. There is no clinical difference in the outcome for severe OSA patients and more research incorporating larger sample studies as well as other OSA severities is needed.

References:

1. Cairns, A et al. A Pilot Validation Study for The NOX T3 Portable Monitor as a Screener for OSA, 2014

2. Richard, B. et al. The AASM Manual for the Scoring of Sleep and Associated Events, Version 2.3

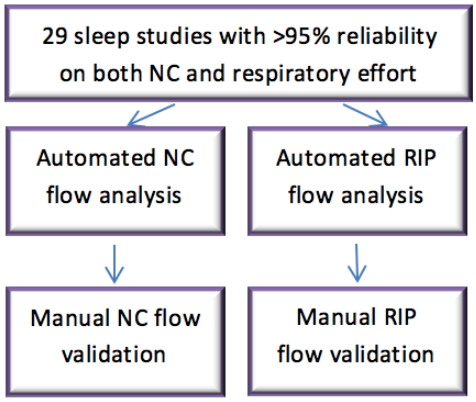
ARTP TRAVEL GRANT WINNER:

Can RIP flow analysis be used as a reliable alternative to nasal cannula flow during sleep studies?

F. Clavaud, V.L. Cooper, Salford Royal NHS Foundation Trust, Stott Lane, Salford.

Introduction: Nasal pressure derived airflow via nasal cannula (NC) is the American Academy of Sleep Medicine's (AASM) recommended way of measuring hypoponeas during a sleep study. The Nox T3 uses a Respiratory Inductance Plethysmography (RIP) from the abdomen and thorax respiratory effort belts to produce a substitute measurement of airflow. The aim of this study was to examine whether RIP flow analysis produces reliable results compared to NC flow analysis.

Method: This non blind study compared the difference in sleep study results between NC flow and RIP flow using the Nox T3 device. Studies from 29 patients with >95% reliability on both the NC flow signal and respiratory effort signals were included. The mean oxygen desaturation index was 25.15.2 % dips/hr, (range 1-118.8). Each study was analysed using two automated protocols (NC flow and RIP flow). Manual validation of events on either the NC or RIP trace, respectively was then performed using the AASM (version 2.1, hypopnoea rule1B, 4% desaturation) criteria by a trained physiologist.
We report the results of Apnoea Hypopnea Index (AHI), Obstructive Apnoea Index (OAI), Hypopnea Index (HI), Central Apnoea Index (CI) and Mixed Apnoea Index (MI). Results are reported as mean SEM. Differences were compared using a student paired t-test.



Results: Twenty-nine (Females= 44.8%, Males =55.2%), were included in the final analysis, with a mean age (52.32 ± 3 years), BMI (40.22 ± 4kg/m^2). Demographics are shown in Table 1. Figure 2. shows the individual differences seen between NC and RIP flow AHI for the validated analysis. There was no significant difference seen between auto analysis NC and RIP in CI or MI. Validated NC was significantly higher than RIP flow for AHI (27.2 ± 4.8 vs. 23.5 ± 4.3 events per hr; P<0.05), MI (0.60 ± 2vs. 0.30 ± 3 events per hr; *P*<0.05) and OI (10.3 ± 2.2 vs. 4.41.2 events per hr; *P*

<0.05). There was a significant difference between NC and RIP flow automated protocols in AHI (27.7 ± 4.9 vs. 23.4 ± 4.3 events per hr; *P* <0.05), HI (16.4 ± 4.2vs. 19.0 ± 4.3 events per hr; *P* <0.05) and OI (8.6 ± 1.9 vs. 2.1 ± 0.4 events per hr; *P* <0.05). No significant difference was seen between NC automated and validated protocols in AHI, OI, CI, MI and HI. Validated RIP flow OI was significantly higher than auto-analysed RIP flow OI (4.4 ±1.2 vs. 2.1 ± 0.4 events per hr; *P* <0.05) and validated RIP flow HI was significantly lower than auto-analysed RIP flow HI (16.8 ± 3.9 vs. 19.0 ± 4.3 events per hr; *P* <0.05). No other significant differences where noted in the RIP flow protocols. The mean differences between NC and RIP flow values for automated and validated analysis is shown in Figure 1.

Male: Female	Age	BMI	ODI
16:13	52.3±2.3	40.2±2.4	25.1±5.2

Table 1. Patient Demographics

	Auto-analysis NC		Auto-analysis RIP		Validated NC		Validated RIP
OAI	8.6±1.9	*	2.1±0.4	$	10.3±2.2	*	4.4±1.2
CAI	1.6±0.7		3.7±2.2		1.9±0.7		2.0±0.9
MAI	1.1±0.5		1.3±1.0		0.6±0.2	*	0.3±0.3
HI	16.4±4.2	*	19.0±4.3	$	14.5±2.9		16.8±3.9
AHI	27.7±4.9	*	23.4±4.3		27.2±4.8	*	23.5±4.3

Table 2. Auto-analysis and manual validation indices for the nasal cannula (NC) and Resistance Impedance Plethysmography (RIP) flow analysis. * NC flow v RIP flow *P*<0.05, § = automated v validated analysis *P*<0.05

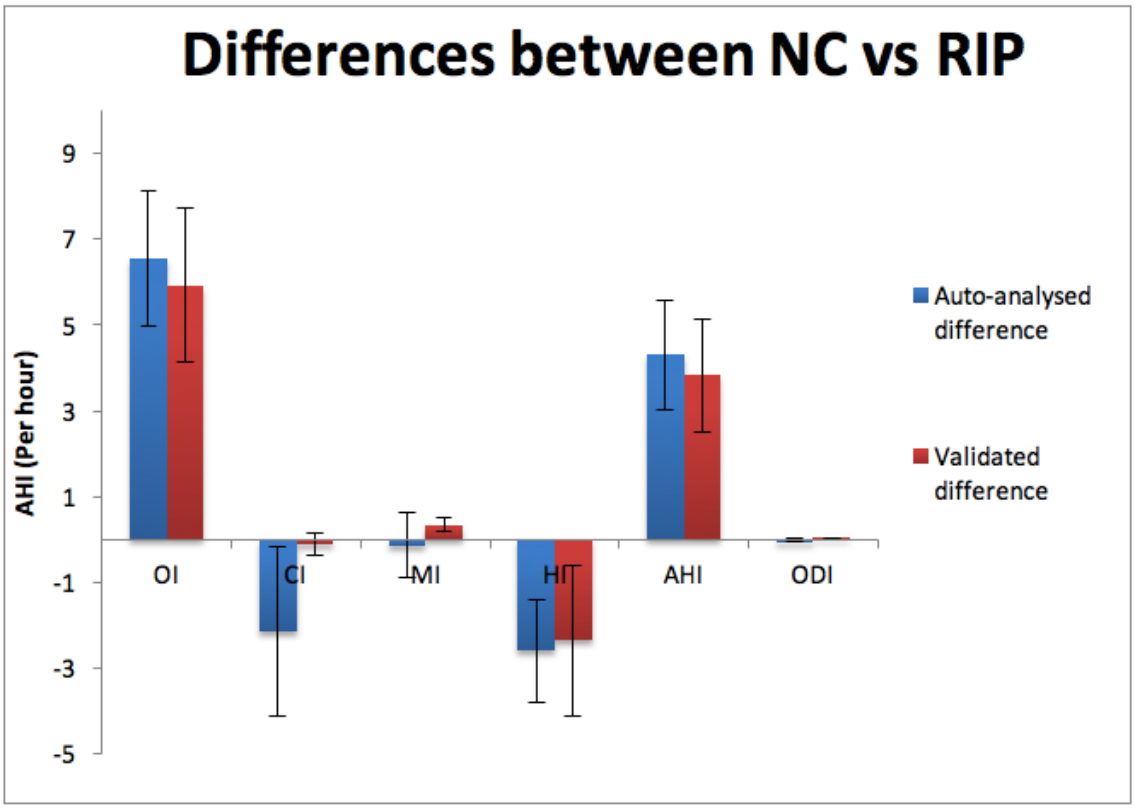


Figure 1. Mean differences between NC and RIP flow for automated and manually validated analysis.

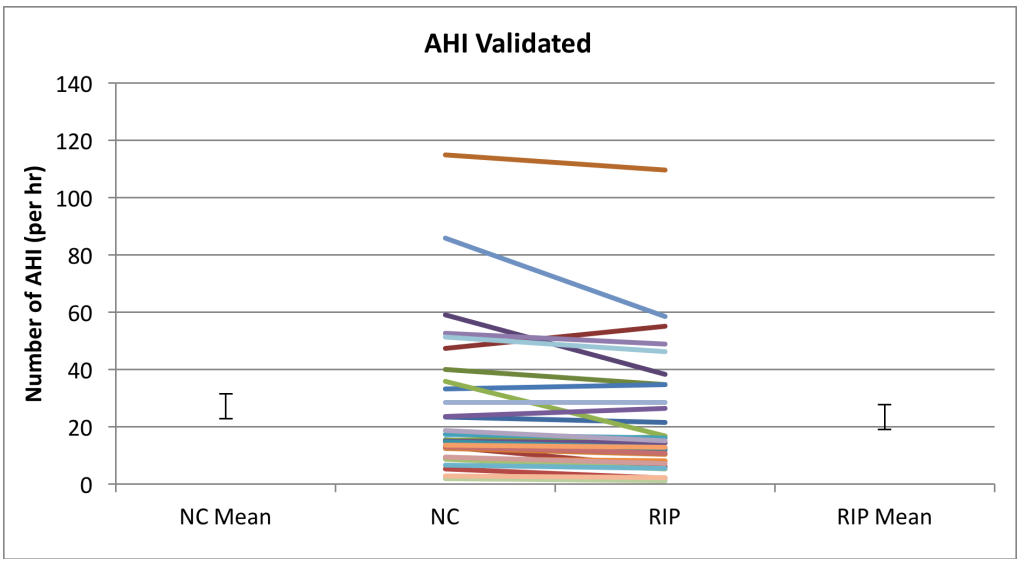


Figure 2. Individual and mean AHI after manual validation for NC and RIP flow.

Conclusion: RIP flow underestimates AHI, OAI and MAI compared to NC when events are manually validated. It was noted that some events had more marked reductions in NC flow compared to RIP flow, such that some apnoeas on the NC channel were more like hypopnoeas on RIP flow, resulting in a lower OI and higher HI for RIP. However, these events did not always meet the desaturation criteria they could not be scored resulting in a lower AHI. Manual validation for NC flow did not result in significant differences to values, whereas RIP flow validation did. The above results should be borne in mind when RIP flow is used to report sleep studies

Acknowledgements: ARTP Travel Grant; Philips Respironics UK.

ARTP TRAVEL GRANT WINNER:

Service Review of Good Hope Hospitals' Continuous Positive Airway Pressure (CPAP) Annual Follow Up Routine Appointments

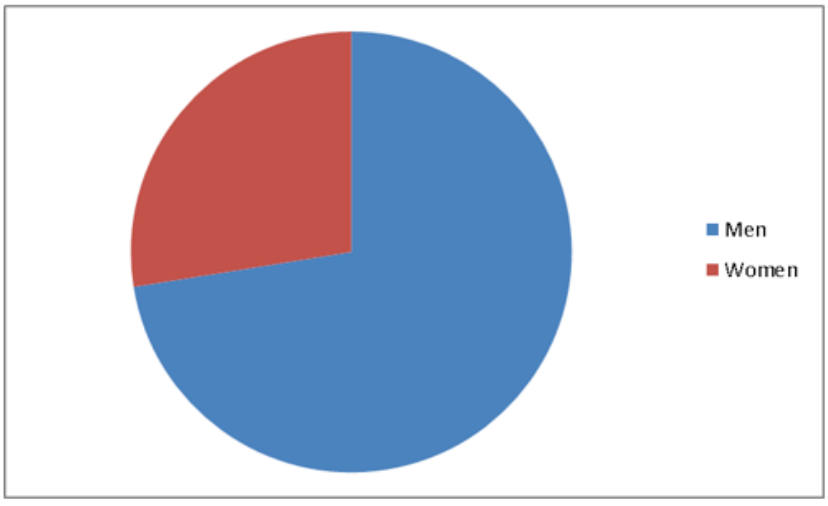
Newby, K., Lloyd, J., Newey, D. & Kaur, B. Respiratory & Sleep Investigation Department, Good Hope Hospital, Heart of England NHS Trust, Sutton Coldfield, West Midlands

Aims: Due to increasing numbers of patients' requiring long-term CPAP follow up at Good Hope Hospital, it has become challenging to review all the patients annually. The use of remote monitoring technology has been suggested as a management solution. It was assumed that patients would prefer remote monitoring and reduced hospital visits. A patient questionnaire was used to test this hypothesis before making changes to the current service delivery.

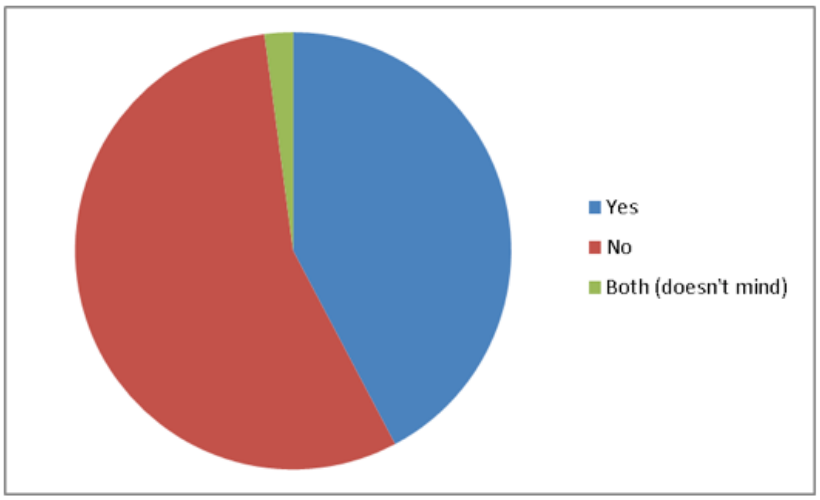
Methods: A patient questionnaire was developed in April 2016 to assess the patients response to suggested changes to the CPAP follow up service and how they preferred to be contacted. The questionnaire was sent out with CPAP annual follow up appointment letters over a three month period between May and July 2016. They were returned at their CPAP annual follow up appointment. The questionnaire explored our current service and whether patients found it beneficial to be seen for a consultation as opposed to collecting consumables only.

Results: 144 patients returned questionnaires. The majority were men (72%).

Figure 1: Gender of patients completing the questionnaire



Upon analysis as a whole; 79% of respondents found an annual appointment beneficial and 63% of patients preferred a consultation, opposed to just collecting consumables. 56% of respondents would *not* prefer drop in clinics (opposed to a consultation appointment). 68% of patients found



overnight oximetry useful. 53% of respondents would like the onus of care left to themselves. 83% of patients indicated that remote monitoring was appealing and 70% indicated they were happy to receive communication via email.

Figure 2: Patients preferring a consultation to drop-in clinics

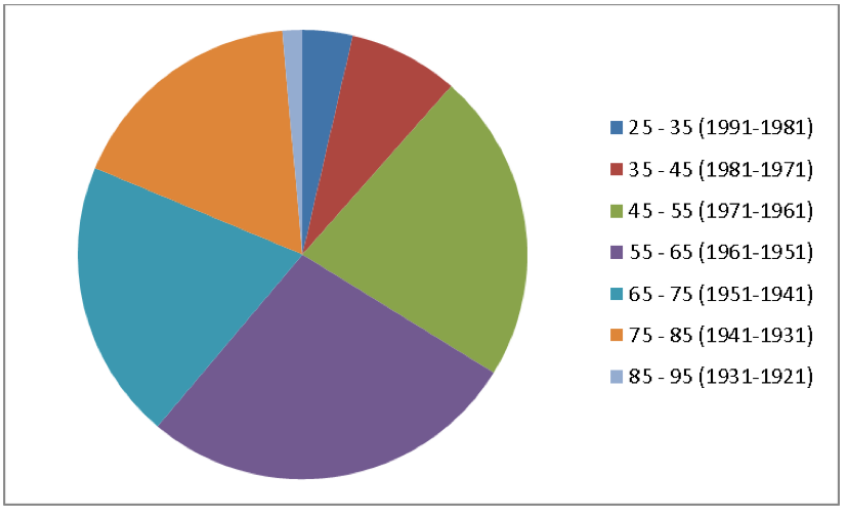


Figure 3: The age ranges of patients completing the questionnaire

The data was further analysed by gender and age group. The majority of respondents were 55-65 years (25% male; 34% female).

65-75 year old females were the only age group and gender that would prefer collection of consumables without a consultation. 55-65 year old females were the only age group that would *not* prefer drop in clinics, whereas this covered a greater age range in males. (25-35, 45-65 and 75-85 year olds).

45-55 year old and 75-85 year old females would *not* like the onus of care left to themselves, whereas this was the case for a wider range in age groups in men (35-65 year olds and 75-85 year olds). No significant differences in responses were seen between gender or age group.

Discussion:The majority of patients found a benefit coming to clinic for a consultation, as opposed to just receiving consumables. However, they would prefer to contact the department for appointments rather than receiving routine appointments. The majority would *not* prefer drop in sessions to an appointment and most patients found overnight oximetry useful. Most patients

would like the onus of their care left to themselves. Most patients would like remote monitoring and would like to be contacted by email.

Outcomes of the Survey:Based on this survey, a modified service using remote monitoring with an additional drop in clinics for patient led follow up has been trialled since October 2016. The duration of an appointment slots has been reduced from 30 minutes to 15 minutes, and will be for collection of consumables and download of their CPAP machine only. Patients are provided with a summary of their current details and will complete an amendment sheet along with an Epworth Sleepiness Score (ESS). All patients were contacted and informed of the changes to their next annual review and the reasons for this.

With the introduction of ResMed AirSense 10 CPAP's, we will offer remote monitoring to all patients for 3 months, with the option to extend this if clinically indicated. Overnight oximetry will be performed only if clinically indicated i.e. professional drivers, significant weight gain or significant increase in ESS.

We are currently investigating the feasibility of email reminders for patient review, but are limited by IT related issues.

Future work

Although this modified service may not suit all patients, the survey results suggest that a high percentage will still be satisfied.

The impact of the changes on workload and patient satisfaction will be monitored at 3 and 6 months and further changes to service delivery made as required.

References

1 ARTP (2013) ARTP Standards of care for sleep apnoea services (Diagnostics), Version 6a, Section 1.6 Workforce Issues, P.2.
2 ARTP (2016) ARTP Standards of care for sleep apnoea services (CPAP), Version 5b, Section 1.6 Workforce Issues, P.2.
3 ResMed (2014) Airsense clinical guide, Data management and therapy compliance, Remote monitoring, P.28

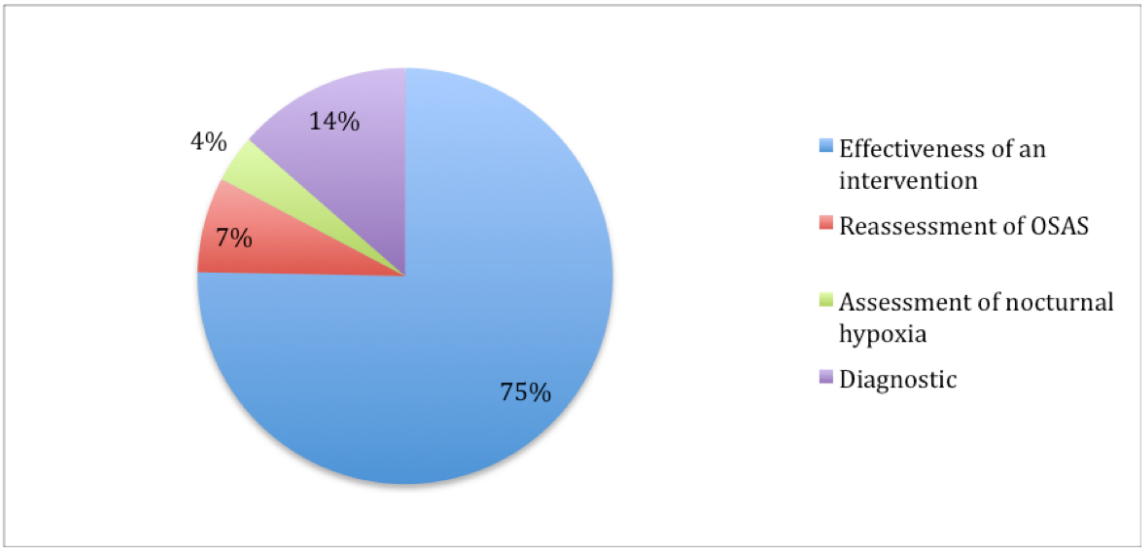
Utilisation of Overnight Oximetry in a Regional Sleep Service

Webber, S. Respiratory Physiology and Sleep Disorders, Heart of England NHS Foundation Trust, Birmingham, UK

Introduction: Continuous positive airway pressure (CPAP) is still considered the gold standard treatment for Obstructive sleep apnoea (OSAS). It has been well documented that overnight oximetry is useful in aiding the diagnosis of OSAS and managing patients previously diagnosed with the condition.

Aim: The purpose of this study is to assess the utilisation of overnight oximetry in a regional sleep service.

Method: All patients referred for overnight oximetry between 17th May 2016 and 31st August 2016 were retrospectively reviewed. The reason for referral and source were recorded.



Results: In total 84 patients were referred for overnight oximetry during this period. A total of 61 (75%) patients underwent overnight oximetry to assess the effectiveness of CPAP therapy, 11 (14%) of referrals utilised overnight oximetry to diagnosis OSAS, 6 (7%) were referred for the reassessment of OSA and finally 3 (4%) patients underwent overnight oximetry for the assessment of nocturnal hypoxia. 73 out of 84 (87%) referrals were requested by a sleep consultant, the remaining were a mixture of general respiratory and various other specialities.

Discussion: Overnight oximetry is utilised most in patients already diagnosed with OSA from multichannel sleep testing, in order to assess the effectiveness of CPAP therapy. The utilisation of overnight oximetry in this manner should be continued in order to allow appropriate optimisation of CPAP therapy.

Comparison of CPAP pressures using a predicted equation versus 95th percentile calculated by auto-titrating CPAP machines

Cramp,G; Clarke,D; Goodlad, M; Matharu,T; Shakespeare,J. Respiratory Physiology and Sleep Department, University Hospitals Coventry and Warwickshire NHS Trust.

Introduction: Obstructive sleep apnoea (OSA) can be successfully treated with continuous positive airway pressure (CPAP). The optimal pressure required to treat a patient's OSA can be determined by titrating the pressure over numerous nights, using a predictive equation or by utilising an autotitrating CPAP device to establish the 95th percentile pressure. Our department routinely uses autotitrating CPAP's however despite improvements in costs of these devices in recent times they still costs approximately £100 per person more than a fixed pressure device. Many patients with OSA can be effectively treated with fixed pressure devices which therefore has the potential to save costs.

A predicted CPAP equation was published by Loredo et al. in 2007(1). This equation utilises parameters such as anthropometric measurements, sleep parameters and the Epworth Sleepiness Scale. The resultant equation is:
CPAP pred = (30.8 + RDI x 0.03 – Nadir Saturation x 0.05 – Mean Saturation x0.2)
RDI = mean respiratory disturbance index (AHI/Total sleep time)

Aims: The aim of our study was to compare the predicted equation for CPAP pressure to the 95th percentile pressure from an auto titrating CPAP device. We also assessed the impact of device (using two different manufacturers) on the comparison between predicted equation and 95th percentile pressure.

Methods: The study included 40 patients (29 Male). Data was collected retrospectively from compliance data obtained from routine CPAP follow up clinics over a six month period. Equipment included ResMed S8, S9 and S10 devices and Phillips Respironics (Remstar range) devices and these were analysed using Rescan and Encore Pro 2 respectively. Data was limited to patients with greater than 70% compliance with therapy.

Results: There was no statistically significant difference between the predicted CPAP pressure and the 95th percentile pressure (p=0.2517) for the group as a whole.

Comparison of the predicted CPAP pressure equation and 95th percentile pressure by CPAP manufacturer did demonstrate significant differences. There was no difference between the pressure predicted by the Phillips Respironics devices (n=15) and the predicted equation (p=0.3847) with a mean difference of 0.76 cmH2O. However the mean difference between the predicted pressure using the ResMed devices (n=24) was 1.375 cmH20 and this was statistically significant ($p<0.05$).

Conclusion: This study demonstrates that for our patient group as a whole, the predicted equation is consistent with that from auto titrating CPAP devices. However, when the group was split according to equipment manufacturer there were significant differences. A limitation of the study was the sample size, this could have been larger and each device used in the second arm of the study could have had equal numbers used, as this may have contributed to the statically differences between the devices.

References

1. Loredo JS, Berry C, Nelesen RA, Dimsdale JE (2007) Prediction of continuous positive airway pressure in obstructive sleep apnea. Sleep Breath 11:45-51

ARTP TRAVEL GRANT WINNER:

Signal Scoring Integrity in Paediatric Cardiorespiratory Sleep Studies

A. Godinho,Great Ormond Street Hospital for Children NHS Foundation Trust

Introduction: At Great Ormond Street Hospital for Children we carry out approximately 2000 paediatric sleep studies a year, with the majority being cardiorespiratory sleep studies. To ensure quality standards are maintained, a score was devised for staff to use to assess signal integrity. Our attended paediatric cardiorespiratory sleep study measurements include respiratory bands (thorax/abdomen), S_pO_2 and pulse rate (oximeter), transcutaneous CO_2 (T_cCO_2), position and nasal flow (cannula).

Method: Overnight sleep studies were recorded by the Embla cardiorespiratory sleep system (S4500 head box incorporating Nonin oximeter, Embla snap lock respiratory effort bands plus other sensors) and the Radiometer TOSCA 500 transcutaneous monitor was used for T_cCO_2 measurement. The studies were analysed using Embla REMlogic software (Version 2.0) according to the American Academy of Sleep Medicine [1] paediatric guidelines, which specify that the minimal numbers of channels required for diagnosis are the respiratory effort bands, S_pO_2 and T_cCO_2. A signal integrity score for S_pO_2 and nasal flow was incorporated into the generated REMLogic analysis report

The signal integrity score for S_pO_2 calculated the percentage (%) of acceptable signal vs. artefact during the Total Sleep Time (TST) of the study (i.e. [acceptable signal]/ [acceptable signal plus artefact] x 100). A result > 50%TST was considered a pass and <50% a fail. The same pass/fail criteria was used for the T_cCO_2 trace however this was estimated by looking at the overall trace and judging by eye whether the signal reached passing criteria for %TST as due to having previously used different CO_2 recording devices it was not possible to include this value in the automated report.

Figure 1: Overview of study: assessing T_cCO_2 quality, CO_2 PASS

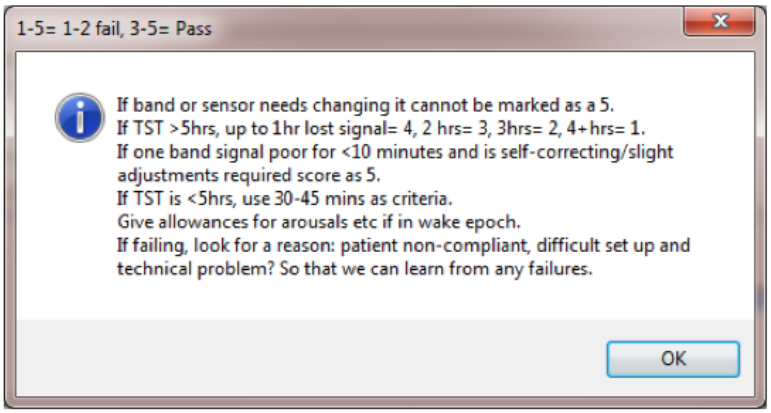


Figure 2: The Respiratory Band scoring system

Respiratory effort bands were graded 1-5 based on the amount of time the signal was artefact-related (Figure 2).

The sleep laboratory report database (Microsoft Access 2010) was amended to allow the input of integrity score values at the time of writing the report (Figure 3) and the database was subsequently queried to retrieve the results.

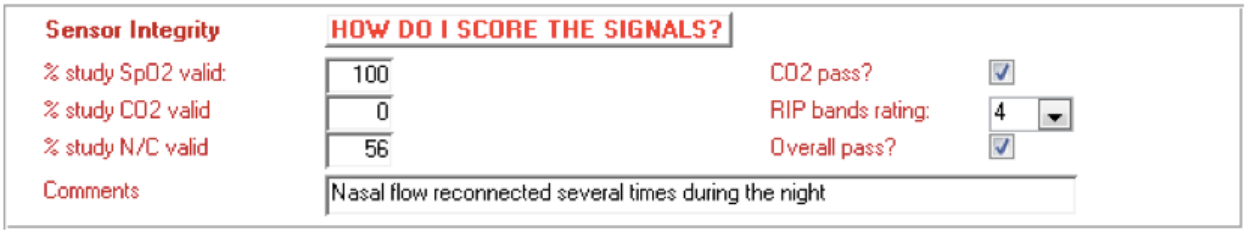


Figure 3: Inputting the score data

A failed study was reviewed to find the reason(s) for failure and general sensor or study advice was fed back to all staff via email.

Results and Discussion

Over an 8 month period 789 studies out of 1428 performed were audited (55%) (Table 1). The score identified 771/789 (98%) studies as having adequate signal integrity with one study failure which was due to T_cCO_2 not recording accurately. This was confirmed by using End Tidal CO_2 spot checks throughout the study. Further failures were due to poor respiratory effort band signals which were overcome by purchasing new sensors.

Signal	Mean Signal Integrity Score	SD
S_PO_2	94.2%	15.8
T_cCO_2	58.8%	35.2
Effort Bands	4.4/5	0.8
Nasal Flow	57.7%	39.2
Overall Study	97.2%	-

Table 1: A summary of the results

Nasal flow was recorded less successfully (57.7%TST) probably due to some of the patients being ventilated, both non-invasively (via mask) or invasively (tracheostomy) or where the patient had a nasopharyngeal or nasogastric tube in situ. Nasal flow was not included in the overall pass/fail criteria.

Conclusion

We have created a scoring system to identify whether the quality of sensor signals collected has been of sufficient quality to allow for the successful interpretation of the sleep study data. Most of the paediatric cardiorespiratory sleep studies recorded passed our signal integrity criteria, with nasal flow the signal most likely to fail. The signal score is now incorporated into our daily practice and is used to assess the practice of physiologists, providing feedback and improving study quality. An aim for future improvement is to improve the scoring of the T_cCO_2 signal, initially by physically measuring the T_cCO_2 signal duration (on paper) to more accurately calculate the % TST of valid signal vs. overall signal and eventually by incorporating the score into the automated REMLogic report. We also aim to assess the inter-observer reliability of the signal integrity score. We are currently arranging a training day for all staff to improve the response rate and to standardise the consistency of reporting.

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Quality Review of Embletta Polygraphy Service

B G Cooper, S Gunn, G Johal, N Harte, T Sharley, M Jones, V Batsford, H Griffin, L O'Reilly, J Savage, JA Stockley & J A Hunt. Lung Function & Sleep, Queen Elizabeth Hospital Birmingham, B15 2GW.
Correspondence: brendan.cooper@uhb.nhs.uk

Aim: We noticed recurrent failures with routine polygraphy studies and decided to monitor occurrences and feedback failures to the sleep apnoea team and see if feedback on service quality and changes to probes improved study outcomes.

Methods: We reviewed 193 consecutive, polygraphy studies using Embletta (SSI, Oxford, UK) in our routine service over 20 weeks. When each study was analysed by one operator (BC), all channels (oximetry, flow, snoring, thorax, abdomen and position) as well as short studies (<4 hours) and no data recorded were scored as either "OK", "Partial" or "Fail" in terms of quality. "Partial" was defined as the absence of a signal for more than 1 hour in the study. An overall study score using the three categories was used to categorise perfect and suboptimal outcomes. During the study, staff were informed of the polygraphy failure rates and new equipment with different probes (thorax, abdomen and oximeter) were introduced (June) to improve quality and a log of which staff set up each study was recorded.

Results: The table shows the summary of the successful signals and studies for each month.

Month (n=)	Oximetry	Flow	Snore	Thorax	Abdom	Position	Short	No Data	Overall
May (37)	81.1%	89.2%	81.1%	89.2%	86.5%	100.0%	97.3%	91.9%	**45.9%**
Jun (34)	70.6%	79.4%	79.4%	79.4%	64.7%	94.1%	94.1%	94.1%	**26.5%**
Jul (31)	87.1%	74.2%	90.3%	74.2%	67.7%	93.5%	87.1%	93.5%	**45.2%**
Aug (38)	85.0%	95.0%	100%	100.0%	95.0%	100.0%	90.0%	100.0%	**70.0%**
Sep (40)	87.5%	95.0%	97.5%	95.0%	87.5%	95.0%	92.5%	97.5%	**75.0%**
TOTAL	**81.3%**	**84.4%**	**86.9%**	**85.0%**	**79.4%**	**95.6%**	**91.9%**	**93.1%**	**50.6%**

Discussion: The overall faultless study rate was 51% but significantly improved over the 20 weeks. The most unreliable signals were the oximeter and abdominal probes. The position monitor was the most reliable and only 8% of studies were too short. There were no significant patterns regarding who set the polygraphy up, but feedback and/or the new probes improved most signals in the last 2 months

Conclusions: Monitoring quality in routine polygraphy can (1) improve outcomes and enable improved success rates; (2) shows the impact of changing probes and (3) increases staff awareness of failures and improve service quality.

Comparison of auto-titrating CPAP derived apnoea-hypopnoea index with pulse oximeter oxygen desaturation index in patients with obstructive sleep apnoea

O'Sullivan , C., Clinical Measurement Unit, Walsall Manor Hospital & Kendrick, A.,– University Hospitals Bristol

Introduction:

The gold standard therapy for treating OSA is continuous positive airway pressure, CPAP. Some CPAP machines provide additional data that aims to optimise therapy, such as apnoea-hypopnoea index, AHI.

The AHI measured via autoCPAP is the AHI that remains despite CPAP use, termed residual AHI. For optimal OSA control the aim is to achieve a residual AHI <5. Previous research into accuracy of autoCPAP derived AHI has provided conflicting results. Algorithms for detecting residual AHI vary in sensitivity, specificity and overall accuracy [1,2]. Formal validation is therefore required before use of such parameters is incorporated into clinical practice, and used to influence the management of OSA.

The purpose of this study was to compare the residual AHI measured by current department autoCPAPs, with oxygen desaturation index, ODI, measured via pulse oximetry, whilst reviewing patients as per normal practice. The aim was to evaluate agreement between AHI and ODI to determine whether CPAP AHI could be used as a surrogate for ODI.

Methods:

This retrospective single centre study included adult patients who had received a formal diagnosis of OSA (ODI on pulse oximetry, or AHI on limited multichannel sleep study >5) who were currently being treated with DeVilbiss Healthcare autoCPAP machines which give residual AHI. Routine monitoring required patients to complete a simultaneous pulse oximetry study using with Konica Minolta Pulsox 300i oximeter which gave 3% and 4% ODI.

DeVilbiss-SmartLink and Visi-download databases were cross referenced to identify consecutive patients that had completed a simultaneous PO study with autoCPAP use.

The criteria used to define an apnoea by DeVilbiss sleep cube autoCPAP is; an absolute fall in respiratory flow to 10%, for hypopnoea an absolute fall in respiratory flow to 50%. Recorded apnoeas and hypopnoeas are combined and expressed per hour to give the AHI.

Residual AHI was compared with 3% and 4% ODI.

Results:

Data from 103 patients was included in the analysis, figure 1. Figure 2 shows Bland-Altman plots for data, transformed by natural log to achieve normal distribution. The exponential of the mean difference, upper and lower limits of agreement were calculated to relate values back to original data.

The mean difference 4% ODI and AHI was 0.61, with limits of agreement ±3.42. This shows that within this study sample overall the autoCPAP residual AHI measurement was slightly lower than 4% ODI. The limits of agreement show that 95% of all AHI readings will not disagree with 4% ODI measurement by more than 3.41.

The mean difference of 3% ODI and AHI was 1.06, with limits of agreement ±4.37.

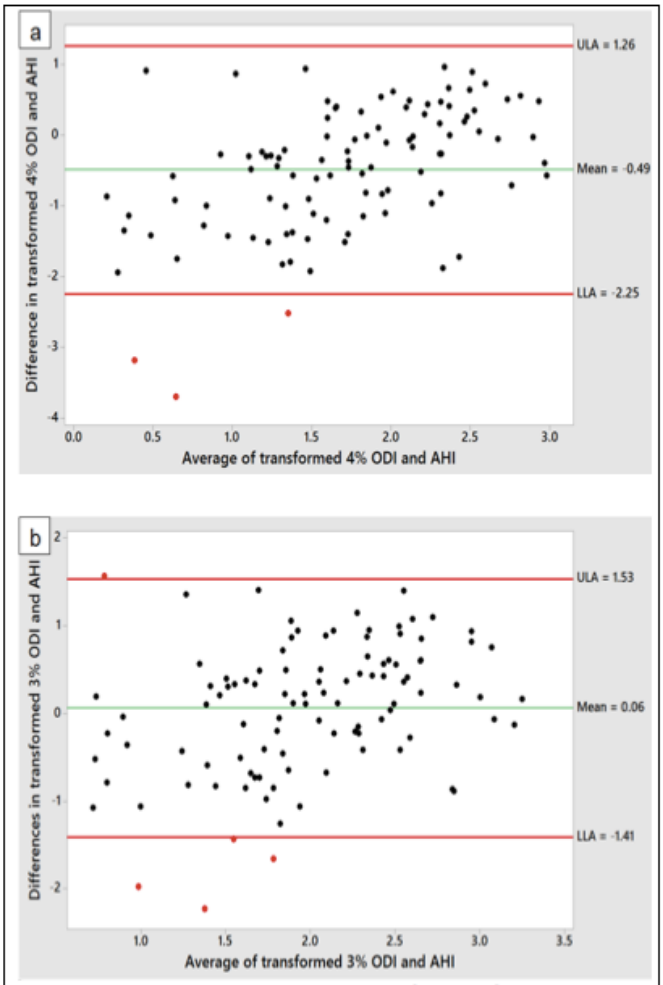

Figure 2. Bland-Altman plots of transformed data, oxygen desaturation index (ODI) and apnoea-hypopnoea index (AHI). The difference between Ln-ODI and Ln-AHI, Ln-ODI – LnAHI, is plotted against the difference in the two measurements. The green line indicates the mean difference, the red lines indicate the 95% limits of agreement. a = 4% ODI. b = 3% ODI.

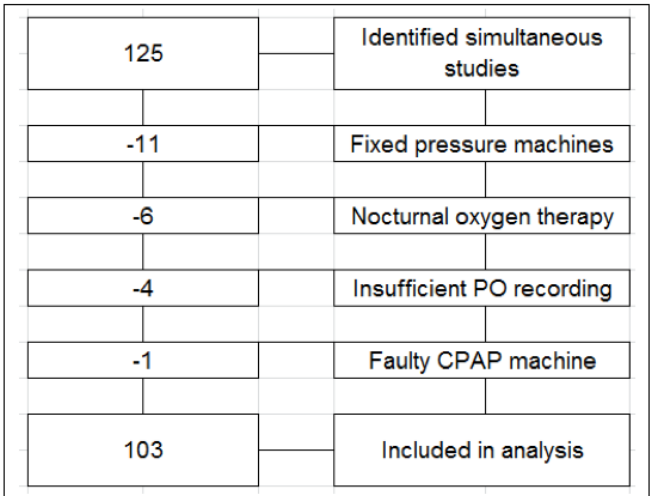

Figure 1: Breakdown of patients excluded from study to achieve study N of 103.

This shows that within this study sample overall the autoCPAP residual AHI measurement was also slightly lower than pulse oximeter 3% ODI. The limits of agreement show that 95% of all readings will not disagree with 3% ODI measurement by more than 4.37.

The intraclass correlation coefficient, ICC, for 4% ODI and AHI was 0.498, 95% CI 0.196 to 0.697. The ICC for 3% ODI and AHI was 0.623, 95% CI 0.443 to 0.745.

Conclusion:

Although Bland-Altman analysis suggests that for this study sample AHI may be used as a surrogate for ODI, the confidence intervals of the intra-class correlation coefficients show there to be too much variation within the population. Poor agreement in AHI and ODI, within the clinical context, suggest that the data from the autoCPAP device may not be accurate enough to allow appropriate clinical assessments of patients outcome.

Further analysis of the data and subdivision of patient groups according to mask type or mask leak, for example, may identify a group for which the autoCPAP AHI confidently agrees with ODI.

In conclusion this study has shown that DeVilbiss Healthcare sleep cube autoCPAP residual AHI should not be used solely as a surrogate for ODI in this patient group. Clinicians must be aware of the limitations of any method used to obtain objective data on OSA patient management, and exercise caution where necessary in the clinical scenario.

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A retrospective audit of clinical data to determine whether, within one West Midlands NHS Trust, NICE (2008) guidance is followed for the treatment of Patients with Obstructive Sleep Apnoea.

Davenport, J.

Aims:

The Primary aim of this study was to conduct a retrospective audit of adult out-patient data, to assess the performance of a West Midlands NHS Trust, in the assessment and treatment of patients with Obstructive Sleep Apnoea (OSA). The treatment pathway of patients was examined to see if the NHS Trust adhered to NICE (2008) guidance on OSA

The secondary aim of this study was to evaluate the potential role of Apnoea Hypopnoea Index (AHI), Oxygen Desaturation Index (ODI), Body Mass Index (BMI. and Vibratory Snore Index (VSI) scores on the severity of OSA and on the initiation of CPAP treatment. The audit looked at the incidence of positive OSA to see if having Mild, Moderate or Severe AHI, desaturations of SpO_2 greater than 4%, raised BMI. or increased VSI scores resulted in patients commencing CPAP therapy. The aim being to evaluate the prevalence of snoring as a possible risk factor and consider the impact that might have on the patient diagnosis and treatment pathway. Identifying risk factors for OSA would be a useful tool, as the early diagnosis and treatment of the condition could prevent associated complications from developing in the future (ARTP, 2005).

Methodology:

The scientific methodology of this audit was to conduct a retrospective analysis of the historical data derived from 207 adults out-patient records (within a West Midlands NHS Trust) over a one year period (2014). This data was collected as part of normal clinical diagnostic practice from sleep studies carried out using Limited Channel Polysomnography testing (including Pulse Oximetry) to give AHI, ODI, BMI and VSI data. All data was anonymised and examined for compliance with NICE (2008) guidance on treatment of patients with OSA.

All data was analysed using Meta-analysis of descriptive statistics to calculate the Central Tendency of SpO_2 desaturations > 4%, AHI scores, BMI scores and VSI scores to determine the mean, median and mode, range, variance, standard deviation and standard error of the scores.

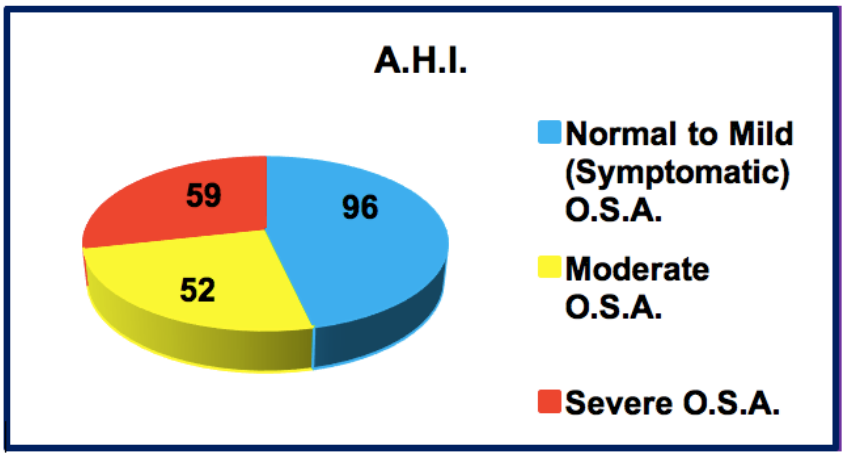

Figure 1. AHI Scores

Frequencies of AHI, ODI, BMI and VSI were calculated and plotted on histograms and examined for patterns of dispersion. The Correlation Coefficient for AHI, ODI, BMI. and VSI were calculated using Excel software to give an R^2 value and examine the data for possible correlations between the scores.

Results:

In 2014, a total of 207 patients (fig.1.) were correctly assessed as part of normal diagnostic practice in line with NICE (2008) guidance.
95.5% of patients with Moderate to Severe OSA experienced vibratory snore (fig.2.).

A positive correlation between AHI and ODI. scores (fig.3.) was found. However, no significant correlation was found between AHI and BMI or VSI scores.

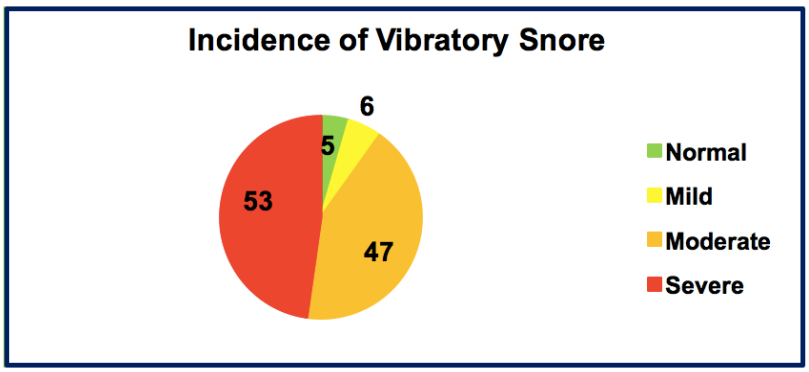

Figure 2. Incidence of Vibratory Snore.

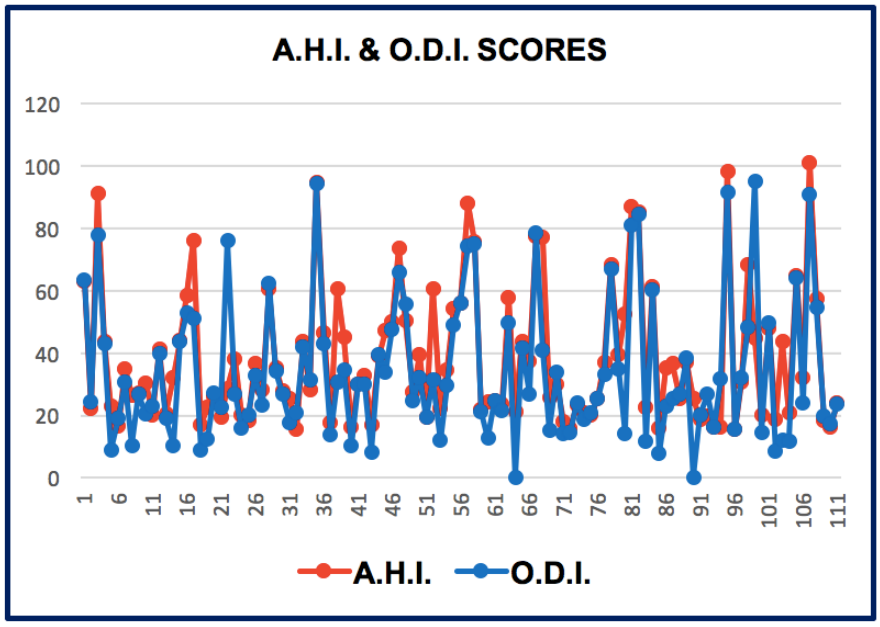

Fig.3. The correlation between A.H.I. and O.D.I. Scores.

76 patients had a normal AHI and were therefore not treated. However, 3 patients with normal AHI scores were symptomatic (had daytime somnolence) and were subsequently issued CPAP therapy ostensibly against NICE guidance.

115 patients, 17 patients with mild (symptomatic) OSA and 98 patients with moderate to severe OSA, were issued CPAP therapy in line with NICE guidance.

6 patients were referred to other services. Of these, 2 patients were referred for bariatric surgery and 2 were referred to the Dietetic service for weight loss programmes. 1 patient was transferred to the care of the Neurology Department and 1 patient was transferred to the care of the Oncology Department as treatment of other conditions took precedence over the treatment of their OSA.

7 patients who were habitual non-attendees, and unlikely to comply with CPAP therapy, were discharged from the service.

According to NICE guidance, patients with Mild (symptomatic) OSA, were correctly treated in 96.9% of cases. Patients with Moderate to Severe OSA were correctly treated in 91.9% of cases.

Discussion:

Around 330,000 people in the UK have moderate to severe OSA. Correct assessment and treatment is essential to manage NHS resources effectively (British Lung Foundation, 2016).

This study examined the implementation of NICE (2008) guidance on the treatment of patients with OSA, within a West Midlands NHS Trust, and found current recommendations were observed in 115

patients who had a raised AHI and in 17 patients who had a raised ODI. All began CPAP trials in accordance with NICE (2008) guidance. However, 3 patients began treatment against guidance to treat daytime somnolence and vibratory snore.

GP referral is often due to the disturbed sleep of bed partners. Previous research suggests that bed partner questionnaires may be a useful tool for assessment as they witness the patient having apnoeic events and vibratory snore (Parish and Lyng, 2003).This audit had some limitations as Sleep study data relied heavily on patients following instructions for Limited Channel Polysomnography tests correctly. 72 Sleep studies were excluded due to insufficient data to determine AHI, ODI or VSI scores and 13 patients left the service so their data could not be included and may have altered findings.

Conclusion:

This study concludes that, during 2014, one West Midlands NHS Trust correctly assessed and treated patients according to NICE recommendations. 96.9% of Patients with Normal to Mild OSA (symptomatic) were correctly assessed and treated appropriately in line with NICE guidance. 91.9% of Patients with Moderate to Severe OSA were correctly assessed and initiated onto CPAP therapy trials in line with NICE guidance.

Acknowledgement:

I would like to sincerely thank my personal tutor Mrs. Jackie Laverty and Mr. Nick John, for their invaluable advice and unwavering support shown during the completion of this dissertation.

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BRIGHTON SLEEP 2017

BSS Biennial Scientific Meeting
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Brighton Sleep 2017 will be the largest multi-disciplinary UK meeting dedicated to sleep medicine and research. With a range of superb speakers, it is an event not to be missed!

Key Note Speakers

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Peter C. Farrell Professor of Sleep Medicine, Harvard Medical School

Professor Morten Kringelbach
Oxford University
Pleasure, Pain and Sleep

Professor Franco Cappuccio
University of Warwick
Epidemiology of Sleep and its Impact on Health

Dr Jason Rihel
University College London

Dr Claire Sexton
Oxford University

Abstract Deadline
5th June 2017

Early Bird Deadline
10th July 2017

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SLEEP IN THE NEWS

SLEEPING TO REPLACE EXERCISE?

David Lloyd Gyms have recently been offering a trial of "napercise" classes, in which participants trade in the exercise bike for a bed. The classes were aimed predominantly at exhausted parents to give them chance to catch up on lost sleep. A spokesperson from the gym group tells the BBC that approximately 86% of parents admit to regularly suffering from fatigue. If this is the case, this class may be just what is needed!

With classes lasting 45 minutes, soothing sounds were played to help those attending drop off to sleep. The studio temperature was also dropped helping to burn more calories!

Sleep expert Kathryn Pinkham helped to collaborate with the gym chain to develop these classes. She told the BBC that it is usually the short term effects of a reduction in sleep that we focus on, such as tiredness and a reduction in our ability to concentrate. However, she states, we should also focus on the long term effects such as physical and mental wellbeing.

It is said that if this class proves a success it may be rolling out into a gym near you!

Full Article: http://www.bbc.co.uk/news/uk-39747807

TEENS NOT GETTING ENOUGH SLEEP?

So this might sound like a fairly obvious statement? Especially with the rise of smart and portable technology. However the American Association of Sleep Medicine (AASM) have recently suggested that the time which children are starting school could also be having an impact. In a recent position statement the AASM have recommended that children should not be starting school any earlier than 8.30 am to ensure they have a full nights sleep. According to TIME magazine the AASM have stated a recommended 8 to 10 hours sleep per night for teenagers. However up to 70% american high school students are reporting around 7 hours or less on a regular basis. This is said to lead to poor school performance, as well as an increased risk of obesity, depressive symptoms and cardiovascular disease.

Full Article: http://time.com/4741147/school-start-time/

CLEAN SLEEP- A NEW TREND FOR 2017.

A-lister Gwyneth Paltrow, among other celebrities, has said that not only is clean eating important, but clean sleeping as well. This is the up and coming new trend and a term which is being used more and more often. Gwyneth has been heard to suggests aiming for around 10 hours sleep a night as an ideal, according to the Express Online. This concept has been developed due to the idea that sleep has a direct impact on your eating habits and energy levels.

However not all of us have the luxury of sleeping 10 hours each night! The Sunday Express talks to sleep expert Dr Nerina Ramalakhan who gives her view on the most important objectives for good quality sleep. Something which may be more realistic for the general population:

Send your articles to S-NEWS@artp.org.uk

1) **Don't travel on an empty stomach:** eat breakfast **before** you get to work.

2) **Drink Alkaline water:** we've all heard about drinking 2 litres of water per day. According to Dr Ramalakhan adding lemon and salt to this helps to keep our body closer to its natural pH.

3) **Think about Caffeine's half life**: Caffeine has a half life of 5 hours and if still in your system when going to bed sleep quality is reduced.

4) **Stop looking at your phone!:** Dr Ramalakhan suggests not looking at your phone at least an hour before bed, and even banning it from your bedroom completely.

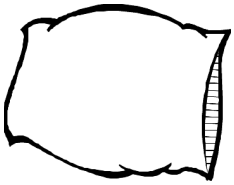
5) **Have 4 early nights each week:** The hours before midnight are important for restoration and could even provide anti-acing benefits. Trying to go to bed by 10.30pm on 4 nights a week will have a positive impact.

Full article: http://www.express.co.uk/life-style/life/758649/What-is-clean-sleeping

GUIDELINE UPDATES.

In March 2017 The American Academy of Sleep Medicine published new guidelines on diagnostic testing for obstructive sleep apnoea in adults. These guidelines can be found at: http://www.aasmnet.org/Resources/clinicalguidelines/diagnostic-testing-OSA.pdf

Have you read any interesting sleep articles in the news? Get in touch!



Pillow Talk:

Manufacturers news, new equipment and a bit of gossip!

Intus Healthcare:

Intus Healthcare presented the BresoDx Sleep Apnoea diagnostic at the 2017 ARTP Conference. The clinically-validated device uses breath sounds to provide an AHI with a 95% correlation to PSG. Since the conference, the BresoDx has become part of Intus' sleep study service. This service provides a BresoDx device for each patient, which can be worn in-home or in-clinic with ease, and a report summary is returned within 48 hours that aids a formal diagnosis. Prices for the service are under £200 excluding VAT per study. For more information, and the clinical research behind BresoDx, visit www.intus.pro/bresodx

Resmed UK:

Richard Coupe has been appointed Sales Manager North with David Liversidge replacing him as Account Manager for the North East whilst Stephanie Muth joins as Respiratory Care Business Development Manager for the South East. Within the Marketing team, Ed Lee has been appointed Marketing Manager, Sleep Therapy Solutions UK. Ed has relocated from Sydney having joined ResMed in 2013 as a Global Product Manager. Victoria Abband is ResMed UK's newest addition joining Ed Lee's team with Oliver Dix & Pedro Nogueira as Product Manager Sleep Therapy Solutions.

ResMed's latest **AirFit 20 series** of masks continues to win over patients and clinicians alike since its launch late last year. Thanks to the largest number of international studies, the Infinity Seal TM silicone cushions used on the AirFit F20 Full Face and N20 Nasal fit respectively 96.5% and 99.4% of all patients tested. Test participants had different face shapes, were of different ethnicities and fit their masks without assistance. Moreover, these results were achieved on masks without forehead support.

ResMed has once again been named **Global Leader in Remote Patient Monitoring**. With 7.1 million patients worldwide being remotely monitored, 2 million from ResMed alone, AirView is ResMed's securely-hosted cloud-based system for managing patients and now has the added functionality of 'Action Groups'. Action Groups can automatically filter patients into actionable groups using fixed criteria e.g. High Mask Leak, High AH, Low Usage and even if there has been no data received. It can help identify non-compliant patients more quickly and effectively.

S-Med:

To celebrate our 15th anniversary, we are pleased to announce the launch of our new website www.s-med.co.uk . Designed to be more informative regarding product content and news, we've also implemented a technical support page where common questions from end-users will be added, making it easier for customers to find answers to their questions. The aim is continue our effort to providing the best support for our customers.

We are also proud to announce that we have been notified by NHS Digital that we have achieved IGSoC 14 Level 2 accreditation and our HSCN Connection Agreement is in place. This means that S-Med can now offer complete remote support for all of our customers across the NHS Digital Network (previously N3).

We will be offering existing customers with service contracts a free upgrade which will include Remote Access for both service and support as well as for remote training. Any customers wishing to use this exciting new facility should contact us so that we can set this up.

SOMNOmedics have released a new version of the popular Home Sleep Video Camera, the new V2 HSC is fully compatible with our SOMNOtouch, SOMNOscreen and SOMNO HD sleep products and continues to record to an

internal memory storage like before but with a much-improved method for setup and download.

Finally….

Well done to Philips Respironics for winning the "Sleep Manufacturer of the Year" award at the ARTP 2017 conference: