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Title: Carbon dioxide monitoring during polygraphy in children with sleep-disordered breathing: Is it necessary?

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Body: Introduction Most adult sleep laboratories do not measure carbon dioxide (CO_2) routinely during polygraphy (PG). In children, CO_2 measurements are “recommended” but few studies have analyzed systematic CO_2 monitoring during PG. Objectives The aim of the study was to assess the prevalence and predictors of nocturnal hypercapnia in children with sleep-disordered breathing (SDB). Methods Systematic transcutaneous CO_2 ($PtcCO_2$) monitoring was performed during overnight PG. Three definitions of nocturnal hypercapnia were used: a maximal $PtcCO_2$>50 mmHg, percentage of sleep time with $PtcCO_2$>50 mmHg >2%, and a $PtcCO_2$>10 mmHg above waking baseline level. $PtcCO_2$ indices were correlated to the apnoea-hypopnoea index (AHI) and oxygenation indices (desaturation index, minimal SpO_2 and percentage of time with SpO_2<90%). Results 221 PGs from patients with suspicion of obstructive sleep apnoea (72%), neuromuscular (21%) and lung diseases (7%) were analyzed. The percentage of hypercapnic patients ranged between 20 and 60%, and was not different between groups whatever the definition of hypercapnia. Significant but weak correlations were observed between hypercapnia according to the 3 definitions and the AHI (r=0.137, p=0.047 for maximal $PtcCO_2$) and oxygenation indices. The Receiver operating characteristic curves showed a poor sensitivity and specificity of the AHI and SpO_2 to predict nocturnal hypercapnia. Conclusion This study shows that 20 to 60% of children undergoing an overnight PG for SDB have nocturnal hypercapnia which is poorly correlated to the AHI and oxygenation indices. A systematic nocturnal CO_2 recording is useful in all children presenting with SDB, whatever the underlying disease.