



EVALUATION OF OUTPATIENT PEDIATRIC SPIROMETRY AUDITS: COMPARISON OF PATIENT COMPLIANCE BETWEEN 2005 AND 2019 ATS/ERS STANDARDS

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Original Abstract

METHOD: In an IRB approved retrospective analysis, we reviewed and compared pediatric spirometry (n=5,400) from 1/2019-12/2020. 20% (n=1,080) of spirometry tests were chosen at random, audited, and then categorized based on patient age. Spirometry audits were analyzed for compliance based on 2005 and 2019 ATS standards criteria. Results were analyzed using Student's t-test to determine statistical significance.

Graph 1

	2005 ATS Standards (%)	2019 ATS Standards (%)	Change (%)	Significance
Total (n=1080)	59.7	75	+15.3	p < .00001
Age 6 (n= 76)	32.9	52.6	+19.7	p < .01
Age 7 (n= 91)	53.8	63.7	+9.9	p < .1
Age 8 (n= 116)	59.4	80.2	+20.8	p < .001
Age 9 (n= 133)	72.9	85	+12.1	p < .01
Age 10 (n= 107)	54.2	78.5	+24.3	p < .0001
Age 11 (n=107)	67.2	82.2	+15	p < .01
Age 12 (n=93)	75.3	90.3	+15	p < .01
Age 13 (n=83)	51.8	79.5	+27.7	p < .0001
Age 14 (n=71)	46.5	78.9	+32.4	p < .0001
Age 15 (n=51)	41.2	80.4	+39.2	p < .0001
Age 16 (n=68)	73.5	86.8	+13.3	p < .05
Age 17 (n=52)	67.3	86.5	+19.2	p < .05
Age 18 (n=32)	71.9	87.5	+15.6	p < .10

Graph 1 shows the percentage of compliance and acceptability with the 2005 ATS standards compared with the 2019 ATS standards for pediatric spirometry in our facility based on breakdown of age.

RESULTS: 1,080 pediatric spirometry audits were reviewed; the age range of patients was 6-18 years (median 11.3 years). When comparing spirometry compliance with 2005 and 2019 ATS Standards, compliance was increased by 15.3% when using the 2019 ATS Standards (p < 0.00001). Graph 1 shows the detailed breakdown of compliance based on age and ATS standard year.

Table 1

	2005 Standards	2019 Standards
Acceptable End of Test	A plateau in the volume-time curve or Reaching a minimum Forced Exhalation Time (3 secs < 10 yrs, 6 secs ≥ 10 yrs)	A plateau in the volume-time curve or Expiratory time ≥ 15 sec or FVC within repeatability tolerance or greater than largest prior observed FVC
Repeatability Criteria	-Minimum of three loops -Difference between two largest FVC and FEV1 ≤ 0.150L for patients > 6 years of age -Difference of ≤ 0.100 or 10% for patients ≤ 6 years of age.	-Minimum of three loops -Difference between two largest FVC and FEV1 ≤ 0.150L for patients > 6 years of age -Difference of ≤ 0.100 or 10% for patients ≤ 6 years of age.
Grading System	None	-Spirometry with Grades A, B, or C are useable tests; D is suspect; E might be used to show normal values obtained. Grade A- ≥ 3 acceptable loops that meet repeatability criteria Grade B- 2 acceptable loops that meet repeatability criteria Grade C- ≥ 2 acceptable loops with 2 largest FVC and FEV1 within .200L Grade D- ≥ 2 acceptable loops with 2 largest FVC and FEV1 within .250L

Table 1 displays the criteria for spirometry to be acceptable per 2005 and 2019 ATS standards.

CONCLUSIONS: In our pediatric hospital, introduction of the 2019 ATS Standards has led to a significant increase overall in acceptable spirometry. By eliminating the required minimum time for each maneuver and implementing a grading system to represent the level of confidence of each spirometry test performed by the patient, more acceptable and valid data can be used by the clinician in order to appropriately treat patients who may not have been able to produce acceptable spirometry in the past.

References

1.Graham, B. L., et al. (2019). Standardization of Spirometry 2019 Update. An Official American Thoracic Society and European Respiratory Society Technical Statement. American Journal of Respiratory and Critical Care Medicine, 200(8). <https://doi.org/10.1164/rccm.201908-1590st>

BACKGROUND: The American Thoracic Society (ATS) guides spirometry standards to ensure that results are accurately interpreted and influence care appropriately. In 2019, ATS/ERS standards replaced the 2005 ATS standards and redefined criteria by removing the time requirement and implementing a grading system to allow more acceptable spirometry tests (Table 1). A study of 1,631 children found that only 18% were able to meet the end of test time requirement set by the 2005 ATS standards¹. We hypothesized that there would be an increase in acceptable spirometry for pediatric patients in our facility when using the 2019 ATS guidelines for spirometry compliance.

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Results: 1,080 pediatric spirometry audits were reviewed; the age range of patients was 6-18 years (median 11.3 years). When comparing spirometry compliance with 2005 and 2019 ATS Standards, compliance was increased by 15.3% when using the 2019 ATS Standards (p < 0.00001). Graph 1 shows the detailed breakdown of compliance based on age and ATS standard year.

Conclusions: In our pediatric hospital, introduction of the 2019 ATS Standards has led to a significant increase overall in acceptable spirometry. By eliminating the required minimum time for each maneuver and implementing a grading system to represent the level of confidence of each spirometry test performed by the patient, more acceptable and valid data can be used by the clinician in order to appropriately treat patients who may not have been able to produce acceptable spirometry in the past. Further studies must be done to evaluate the impact to patient care decisions that occur after spirometry is completed.