

## A. Primary Papers on effects of change to pass/fail grading:

1. Wasson L, Cusmano, A Meli, Louh I, Falzon L, Hampsey M, Young G, Shaffer J. Davidson, KW. Association Between Learning Environment Interventions and Medical Student Well-being: A Systematic Review. JAMA. 2016 Dec 6;316(21):2237-2252.

After a systematic review of factors affecting the learning environment, the authors conclude to Pass/Fail grading should be considered as a way to improve emotional wellbeing among medical students. The overall quality of the reviewed evidence was low, but the evidence for pass fail grading was sufficient for the authors to recommend consideration of it as an effective intervention.

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2. Ali M, Asim H, Edhi, AI, Hashmi MD, Khan MS, Naz F, Qaiser KN, Qureshi, SM, Zahid MF, Jehan I Does academic assessment system type affect levels of academic stress in medical students? A cross-sectional study from Pakistan (2015) Med Educ Online 20: 27706

<http://dx.doi.org/10.3402/meo.v20.27706>

In 2 Pakistan medical schools, the authors compared medical students under graded versus P/F assessment systems and found that students under P/F experienced lower levels of test anxiety and lower levels of overall stress.

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3. McDuff, S.G.R., D. McDuff, J.A. Farace, C.J. Kelley, M.C. Savoia and J. Mandel (2014) Evaluating a grading change at UCSD school of medicine: pass/fail grading is associated with decreased performance on preclinical exams but unchanged performance on USMLE step 1 scores. BMC Medical Education 14:127

Change from P/F/H to P/F in pre-clerkship years at UCSD School of Medicine  
Control class has P/F on in 1<sup>st</sup> quarter of 1<sup>st</sup> yr; experimental class also had P/F in 2<sup>nd</sup> year. Found small but significant decrease in Yr 2 grades for experimental class but no change in USMLE Step 1 scores.

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4. Reed, D.A., T.D. Shanafelt, D.W. Satele, D.V. Power, A. Eacker, W. Harper, C. Moutier, S. Durning, F. S. Massie, Jr., M.R. Thomas, J.A. Sloan and L.N. Dyrbye (2011) Relationship of Pass/Fail Grading and Curriculum Structure With Well-being Among Preclinical Medical Students: A Multi-Institutional Study. Acad. Med. 86:1367-1373. [https://etsu-edu-primo.hosted.exlibrisgroup.com/primo-explore/fulldisplay?docid=TN\\_ovid10.1097/ACM.0b013e3182305d81&context=PC&vid=01ETSU&search\\_scope=Everything&tab=default\\_tab&lang=en\\_US](https://etsu-edu-primo.hosted.exlibrisgroup.com/primo-explore/fulldisplay?docid=TN_ovid10.1097/ACM.0b013e3182305d81&context=PC&vid=01ETSU&search_scope=Everything&tab=default_tab&lang=en_US)

5. Spring, L., D. Robillard, L. Gehlbach and T.A.M. Simas (2011) Impact of pass/fail grading on medical students' well-being and academic outcomes. Med. Educ. 45:867-877. Review article. [https://etsu-edu-primo.hosted.exlibrisgroup.com/primo-explore/fulldisplay?docid=TN\\_wj10.1111/j.1365-2923.2011.03989.x&context=PC&vid=01ETSU&search\\_scope=Everything&tab=default\\_tab&lang=en\\_US](https://etsu-edu-primo.hosted.exlibrisgroup.com/primo-explore/fulldisplay?docid=TN_wj10.1111/j.1365-2923.2011.03989.x&context=PC&vid=01ETSU&search_scope=Everything&tab=default_tab&lang=en_US)
6. Wilkinson T. Pass/fail grading: not everything that counts can be counted. Med Educ. 2011 Sep;45(9):860-2 [https://etsu-edu-primo.hosted.exlibrisgroup.com/primo-explore/fulldisplay?docid=TN\\_wj10.1111/j.1365-2923.2011.04018.x&context=PC&vid=01ETSU&search\\_scope=Everything&tab=default\\_tab&lang=en\\_US](https://etsu-edu-primo.hosted.exlibrisgroup.com/primo-explore/fulldisplay?docid=TN_wj10.1111/j.1365-2923.2011.04018.x&context=PC&vid=01ETSU&search_scope=Everything&tab=default_tab&lang=en_US)
7. White, C.B. and J.C. Fantone (2009) Pass-fail grading: laying the foundation for self-regulated learning. Advances in Health Sciences Education, published on-line 12 December 2009.

University of Michigan Medical School: 2<sup>nd</sup> year class P/F vs Honors, High Pass, Pass, Fail: examined performance on 2<sup>nd</sup> yr exams, USMLE Step 1, USMLE Step 2, Student Satisfaction, residency placement.

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8. Bloodgood, R.A., J.G. Short, J.J. Jackson and J. R. Martindale (2009) A change to pass/fail grading in the first two years at one medical school results in improved psychological well-being. Acad. Med. 84:655-662.  
University of Virginia School of Medicine: 1<sup>st</sup> and 2<sup>nd</sup> year P/F versus A,B,C,D,F: Academic performance (pre-clerkship grades, Clerkships grades, USMLE Step 1, USMLE Step 2); residency placement success; satisfaction; psychological well-being. [https://etsu-edu-primo.hosted.exlibrisgroup.com/primo-explore/fulldisplay?docid=TN\\_ovid00001888-200905000-00028&context=PC&vid=01ETSU&search\\_scope=Everything&tab=default\\_tab&lang=en\\_US](https://etsu-edu-primo.hosted.exlibrisgroup.com/primo-explore/fulldisplay?docid=TN_ovid00001888-200905000-00028&context=PC&vid=01ETSU&search_scope=Everything&tab=default_tab&lang=en_US)
9. Rohe, D.E., P.A. Barrier, M.M. Clark, D.A. Cook, K.S. Vickers and P.A. Decker (2006) The benefits of pass-fail grading on stress, mood, and group cohesion in medical students. Mayo Clinic Proc. 81:1443-1448.  
Mayo Medical School: 1<sup>st</sup> year Pass/Marginal Pass/Fail vs. A,B,C,D,F: stress, mood, cohesion, test anxiety, USMLE Step 1.  
[https://etsu-edu-primo.hosted.exlibrisgroup.com/primo-explore/fulldisplay?docid=TN\\_sciversesciencedirect\\_elsevierS0025-6196\(11\)61250-0&context=PC&vid=01ETSU&search\\_scope=Everything&tab=default\\_tab&lang=en\\_US](https://etsu-edu-primo.hosted.exlibrisgroup.com/primo-explore/fulldisplay?docid=TN_sciversesciencedirect_elsevierS0025-6196(11)61250-0&context=PC&vid=01ETSU&search_scope=Everything&tab=default_tab&lang=en_US)
10. Robins, L.S., J.C. Fantone, M.S. Oh, G.L. Alexander, M. Schlafer and W.K. David (1995) The effect of pass/fail grading and weekly quizzes on first-year students' performances and satisfaction. Academic Medicine 70: 327-329.

Robins et al. (1995) studied the effect of a switch from a 4 interval (honors, high pass, pass and fail) system to pass/fail grading (in the first year only) at the University of Michigan Medical School in 1992-93. They compared the 1<sup>st</sup> year performance of the last class (1991-92) under the old 4 level grading

system (honors, high pass, pass and fail) with the first class (1992-93) under the new pass/fail grading system. While they did not provide much of the data within the paper, the authors implied that student academic performance across the entire first year was not changed and claimed "there was no evidence that the students learned only enough to pass in a pass/fail environment." Only one course, Gross Anatomy, provided exact comparison data, as this was the only course that remained entirely unchanged under their new curriculum. The student performance of the pass/fail class in Gross Anatomy (85.0, SD 6.50) was at least as good as that of the previous class which was graded on the honors, high pass, pass and fail system (83.2, SD 7.92). In both classes, students who entered their final examinations with high pre-final scores also did well on their finals (using Pearson's correlations and a Fisher Z-test). The authors conclude that "this suggests that the students in the pass/fail system did not "slack off" when they were assured a passing score but continued to work towards greater mastery of material."

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or

<https://journals.lww.com/academicmedicine/pages/articleviewer.aspx?year=1995&issue=04000&article=00019&type=abstract>

11. Jones, K.G., R.L. Petersen, S.W. Carmichael and W. Pawlina (2003) Effects of pass/fail grading system on academic performance of first year medical students in gross anatomy course. FASEB J. 17:A385 (Abstract)

Mayo Medical School: Changing to P/F on a 1<sup>st</sup> year medical school anatomy course resulted to a significant decline in written examination scores.

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12. Hall, D.L. and T.B. Taft (1976) Pass/fail versus A-F grading: a comparative study. J. Dental Education 40:301-303.

Hall and Taft (1976) studied the effect of pass/fail versus A-F grading on student performance in a dental school setting. This study involved 66 junior dental school students taking a fixed prosthodontics junior clerkship. Virtually no other course competed for study time. Students were assigned to the graded or pass/fail sections of this course by alphabetical order. There was no statistically significant difference in the GPAs for the graded versus pass/fail groups. The grade results showed no significant difference between the two groups in achievement on three separate examinations.

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13. Jesse, W.F. and H.J. Simon (1971) Time utilization by medical students on a pass-fail evaluation system. J. Med. Educ. 46:275-280.

Average time spent by medical students did not decrease under a pass/fail evaluation system.

[https://journals.lww.com/academicmedicine/Abstract/1971/04000/Time\\_utilization\\_by\\_medical\\_students\\_on\\_a.3.aspx](https://journals.lww.com/academicmedicine/Abstract/1971/04000/Time_utilization_by_medical_students_on_a.3.aspx)

## B. Criteria for Residency Selection, including effects of pass/fail grading in med school on residency selection

1. Green, M., P. Jones and J.X. Thomas (2009) Selection criteria for residency: results of a national program director's survey. *Acad. Med.* 84:362-367.

Followup to the Wagoner and Suriano (1999) survey. 1200 Residency directors representing 21 specialties rated 17 criteria for residency selection. Grades in preclinical courses ranked among the bottom 3 out of the 14 criteria, while grades in required clerkships ranked #1.

[https://etsu-edu-primo.hosted.exlibrisgroup.com/primo-explore/fulldisplay?docid=TN\\_ovid00001888-200903000-00024&context=PC&vid=01ETSU&search\\_scope=Everything&tab=default\\_tab&lang=en\\_US](https://etsu-edu-primo.hosted.exlibrisgroup.com/primo-explore/fulldisplay?docid=TN_ovid00001888-200903000-00024&context=PC&vid=01ETSU&search_scope=Everything&tab=default_tab&lang=en_US)

2. Poirier, M.P. and C.W. Pruitt (2003) Factors used by pediatric emergency medicine program directors to select their fellows. *Pediatric Emergency Care* 19: 157-161.

Of 15 criteria for choosing medical students for interviews for Pediatric emergency medicine fellow positions, medical school grades were listed as 2<sup>nd</sup> least important criterion out of 15 criteria surveyed.

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3. Crane, J.T. and C. M. Ferraro (2000) Selection criteria for emergency medicine residency applicants. *Acad. Emerg. Med.* 7:54-60.

94/118 Emergency Medicine residency directors were surveyed on relative importance of 18 criteria for selecting EM residents. Basic science grades ranked 16/18. Clinical grades ranked #3.

[https://etsu-edu-primo.hosted.exlibrisgroup.com/primo-explore/fulldisplay?docid=TN\\_wj10.1111/j.1553-2712.2000.tb01892.x&context=PC&vid=01ETSU&search\\_scope=Everything&tab=default\\_tab&lang=en\\_US](https://etsu-edu-primo.hosted.exlibrisgroup.com/primo-explore/fulldisplay?docid=TN_wj10.1111/j.1553-2712.2000.tb01892.x&context=PC&vid=01ETSU&search_scope=Everything&tab=default_tab&lang=en_US)

4. Wagoner, N.E. and J. R. Suriano (1999) Program directors' responses to a survey on variables used to select residents in a time of change. *Acad. Med.* 74:51-58.

Surveyed 794 residency program directors across 14 specialties on 12 academic criteria for selecting residents. Grades in pre-clinical courses consistently ranked last or 2<sup>nd</sup> to last among selection criteria. This is a very important study. This is a followup on surveys that Wagoner and Suriano did in 1992 and 1986 and Wagoner and Gray in 1979.

[https://journals.lww.com/academicmedicine/Abstract/1999/01000/Program\\_Directors\\_Responses\\_to\\_a\\_Survey\\_on.23.aspx](https://journals.lww.com/academicmedicine/Abstract/1999/01000/Program_Directors_Responses_to_a_Survey_on.23.aspx)