

**Validity and Feasibility Evidence for the Professionalism Mini-
Evaluation Exercise in Resident Admissions**

BY

NADIA M. BAJWA
B.S., Kent State University, 1996
M.D. Northeast Ohio Medical University, 2001

THESIS

Submitted as partial fulfillment of the requirements
for the degree of Master of Health Professions Education
in the Graduate College of the
University of Illinois at Chicago, 2014

Chicago, Illinois

Defense Committee:

Yoon Soo Park, Chair and Advisor
Rachel Yudkowsky
Nu Viet Vu, University of Geneva

ACKNOWLEDGMENTS

Foremost, I would like to express my sincere gratitude and appreciation to my committee chair and advisor, Dr. Yoon Soo Park. You have been a champion of my study from the start and your encouragement and guidance as a mentor have enabled me to reach this point. I would also like to thank my committee members, Dr. Yudkowsky and Prof. Vu. Dr. Yudkowsky, your insight and feedback have been invaluable to me. Prof. Vu, thank you for the encouragement to pursue this Master, the untiring mentoring, the continuous feedback, and career advice for which I am forever grateful. I also want to thank the committee for letting the defense be an enjoyable learning experience, and for your brilliant comments and suggestions.

I would also like to take this opportunity to thank Prof. Belli for his support for this Master and for his unwavering support of this study. I am also indebted to Prof. Harris and the DME faculty for their continued guidance throughout the Master coursework.

A special thanks to my family. Words cannot express my appreciation of your understanding, sacrifices, and support. Especially to my dear husband and children, thank you for being willing to undertake this adventure with me and for being my strongest cheerleaders!

NMB

TABLE OF CONTENTS

<u>CHAPTER</u>	<u>PAGE</u>
I. INTRODUCTION.....	1
II. METHOD.....	3
A. Sample.....	3
B. Instruments and Administration.....	4
1. Structured letter of recommendation (SLR).....	4
2. Structured interview (SI).....	4
3. Global rating.....	4
4. Professionalism mini-evaluation exercise (P-MEX).....	5
C. Validity Evidence.....	8
1. Content.....	8
2. Response process.....	8
3. Internal structure.....	8
4. Relationship to other variables.....	9
5. Consequences.....	9
D. Composite Score.....	9
E. Feasibility.....	10
III. RESULTS	
A. Content.....	11
B. Response Process.....	12
C. Internal Structure.....	12
D. Relationship to Other Variables.....	13
E. Consequences.....	13
F. Composite Score and Reliability.....	14
G. Feasibility.....	15
IV. DISCUSSION.....	16
V. DISCLOSURES.....	19
CITED LITERATURE.....	20
APPENDICES.....	22
Appendix A.....	23
Appendix B.....	23
Appendix C.....	26
Appendix D.....	27
Appendix E.....	28
Appendix F.....	30
Appendix G.....	33
VITA.....	35

LIST OF TABLES

<u>TABLE</u>	<u>PAGE</u>
I. ITEMS ON THE PROFESSIONALISM MINI-EVALUATION EXERCISE (P-MEX), AS ORIGINALLY REPORTED BY CRUESS ET AL.....	7
II. GENERALIZABILITY STUDY RESULTS FROM THE 2012 AND 2013 COMBINED P-MEX DATA.....	13
III. ODDS RATIOS OF SCORES FROM THE SELECTION INSTRUMENTS IN RELATION TO THE ACCEPTANCE DECISION.....	14

LIST OF ABBREVIATIONS

ACGME	Accreditation Council for Graduate Medical Education
P-MEX	Professionalism Mini-Evaluation Exercise
Mini-CEX	Mini-Clinical Evaluation Exercise
SP	Standardized Patient
UGM-PR	University of Geneva Faculty of Medicine Pediatrics Residency Program
SLR	Structured Letter of Recommendation
SI	Structured Interview
MMI	Multiple Mini Interview
SJT	Situational Judgment Test

SUMMARY

The purpose of this study was to provide validity and feasibility evidence for use of the Professionalism Mini-Evaluation Exercise (P-MEX) in a pediatric residency admissions process. Using a prospective cohort design, in 2012 and 2013, the OSCE-based P-MEX was administered to applicants invited for an interview at the University of Geneva Pediatrics Residency Program. Validity evidence was gathered for content (item analysis and qualitative feedback); response process (inter-rater reliability with intraclass correlation); internal structure (Generalizability); relationship to other variables (correlations); and consequences (logistic regression to predict admission). Kane's formula was used to create composite scores using P-MEX, structured letter of reference (SLR), and structured interview (SI) scores. Differences in the applicant rank list based on composite score versus faculty global ratings were analyzed using Wilcoxon signed-rank test.

Seventy applicants were assessed. Moderate associations were found between pairwise correlations of P-MEX scores and SLR ($r=0.25$, $P = .036$), SI ($r=0.34$, $P = .004$), and global ratings ($r=0.48$, $P < .001$). P-MEX inter-rater reliability was moderately low (ICC=0.36). Reliability of the P-MEX was moderate (G-coefficient=0.45). Including P-MEX scores increased composite reliability from 0.51 to 0.74. P-MEX scores had the greatest correlation with acceptance ($r=0.56$, $P < .001$), were the strongest predictor of acceptance (OR=4.37, $P < .001$), and increased pseudo R-squared by 0.20 points. Rank lists of applicants using composite score versus global rating differed significantly ($z=5.41$, $P < .001$).

SUMMARY (continued)

Use of the P-MEX in the pediatric residency admissions process was a valid way of assessing professionalism among applicants and increased the composite reliability of the admissions process.

I. INTRODUCTION

Helping a resident in academic difficulty is one of the most challenging tasks for residency program directors. Nearly all residency programs have residents in difficulty (94%), with prevalence estimated at 3-7%.^{1,2} Unprofessional behaviors are frequently cited as major shortcomings of residents in difficulty.¹ The impact of a resident in difficulty on a residency program overall can also be very challenging. Time and resources spent to analyze the problem and to plan and conduct remediation are significant and often ineffective, especially when professionalism issues are involved.³ Ultimately, the morale of faculty and residents and the reputation of the program can be at risk. Consequently, it is imperative to screen applicants for unprofessional behaviors during the admissions process, prior to beginning residency training.

Ginsburg and Lingard, in 2006, defined professionalism as the “ability to uphold the principles and values of the profession, as well as the ability to negotiate between competing values in a specific context.”⁴ The Accreditation Council for Graduate Medical Education (ACGME) has stated that standards for professionalism, based on the Dreyfus model, start at “competent” for incoming interns and reach “highly proficient” by the end of their training.⁵ A limited number of studies have evaluated the validity of instruments used to assess or predict professionalism during residency based on assessments during the admissions process.⁶⁻¹⁵ Assessment of professionalism in the residency admissions process differs fundamentally from that of medical school applicants. Residency admission takes

into account specialty-specific criteria, and the pool of residency applicants is more homogeneous than that of medical school applicants.^{16,17}

The Professionalism Mini-Evaluation Exercise¹⁸ (P-MEX) is a 21-item instrument developed to assess professionalism, derived from the Mini-Clinical Evaluation Exercise (Mini-CEX).¹⁹ Physicians are observed during a clinical encounter in which their doctor-patient relationship skills, reflective skills, time-management skills, and inter-professional skills are assessed (Table 1).¹⁸ The P-MEX has been shown to be a valid instrument to assess professionalism behaviors of medical students and residents.^{18,20,21} Multiple assessments (8-12) are needed to achieve acceptable levels of reliability and the use of junior residents as raters is associated with poor reliability.^{18,21}

To date, the P-MEX has not been validated for use in the residency admissions process. We used the P-MEX in the context of standardized patient (SP) cases, in addition to other selection instruments, to assess professionalism behaviors in our pediatric residency applicants. The purpose of this study was to gather validity and feasibility evidence for the use of the P-MEX in assessing professionalism in a pediatric residency admissions process.

II. METHOD

A. Sample

All 73 applicants invited for an interview at the University of Geneva Faculty of Medicine Pediatrics Residency Program (UGM-PR) in 2012 and 2013 (out of 225 applicants) were invited to participate in the study. Applicants were invited for an interview based on a review of their curriculum vitae, personal statement, exam scores, and medical school attended (preference for Swiss medical school graduates).

The Institutional Review Board at the University Hospital of Geneva and the University of Illinois at Chicago granted ethical approval for this study. Written informed consent was obtained from all participants.

Patterson's model for admissions and competencies defined by Randall et al. for post-graduate pediatric training were used to develop the blueprint for the admissions process at UGM-PR (Appendix A).^{22,23} Cognitive variables included applicants' federal and medical school examination scores and prior publications reported in the curriculum vitae.

Applicants had to obtain specified exam scores to be considered for admission. Non-cognitive variables were assessed using scores from two structured letters of recommendation, one structured interview, a global rating following the structured interview, and the P-MEX score. The focus of this study was on the non-cognitive variables in order to best measure the construct of professionalism.

B. **Instruments and Administration**

1. **Structured letter of recommendation**

Each applicant was requested to provide two structured letters of recommendation (SLR) from faculty of their choice (see example, Appendix B); each letter contains six elements (professional integrity, scientific curiosity, management skills, organization, collaboration, and communication skills), and an overall assessment, using a 4-point scale (lower tier, middle tier, higher tier and top 10%).

2. **Structured interview**

Two UGM-PR faculty members together conducted one structured interview (SI) for one candidate on any given interview day, using three structured questions (see example interview question, Appendix C). Faculty interviewers were recruited from a pool of 28 admissions committee members. Interviewers were given an interview guide and participated in a training workshop prior to interviewing candidates. Each interviewer independently rated applicants' responses to each question using a 5-point scale (novice, advanced beginner, competent, proficient, or expert).

3. **Global rating**

Immediately following each structured interview, each faculty interviewer independently gave the applicant a global rating (A+, A, B+, B, and C) taking

into consideration the structured interview, curriculum vitae, and their overall impression of the applicant. Interviewers did not have access to SLR and exam scores.

4. **Professionalism mini-evaluation exercise**

Using Ginsburg's professionalism framework, we developed three SP cases for the P-MEX, representing professionalism challenges commonly seen in pediatric patient encounters. 1. Explanation of a breach in confidentiality to an adolescent 2. A stressed mother who refuses care for her febrile infant 3. A mother who is opposed to vaccinating her child. The knowledge level required to address the challenges was appropriate for a graduating medical student, as defined by the Swiss Catalog of Learning Objectives for Undergraduate Medical Training.²⁴ Cases were developed to maximize the number of scoreable P-MEX items. Professional SPs and SP trainers from the University of Geneva Faculty of Medicine Standardized Patient Program were used to ensure high quality and consistency of portrayal.²⁵ SP cases were piloted on three first-year residents. The first two cases were used in 2012 and all three cases in 2013. Each station was designed to last 13 minutes.

Faculty members not involved in the interview process or the admissions committee served as raters for the P-MEX. They were trained to use the P-MEX scoring rubric by rating video presentations of different levels of performance of each case and discussing potentially unacceptable behaviors.

The original P-MEX form was used without changes; see Table I. Each item was scored on a 4-point scale (unacceptable, below expectations, meets expectations, and above expectations). Items that could not be scored were marked as “not applicable”. On examination day, two trained faculty raters observed and independently rated each candidate for each SP encounter, while sitting behind a two-way mirror and using a paper form. Responses were entered in duplicate in a spreadsheet using Data Scan©. Data was verified by the primary author (NB).

Table I

ITEMS ON THE PROFESSIONALISM MINI-EVALUATION EXERCISE (P-MEX), AS
ORIGINALLY REPORTED BY CRUESS ET AL.

Item Number	
Doctor-Patient Relationship Skills	
1.	Listened actively to patient
2.	Showed interest in patient as a person
3.	Recognized and met patient needs
4.	Extended his/herself to meet patient needs
5.	Ensured continuity of patient care
6.	Advocated on behalf of a patient
11.	Maintained appropriate boundaries
Reflective Skills	
7.	Demonstrated awareness of limitations
8.	Admitted errors/omissions
9.	Solicited feedback
10.	Accepted feedback
12.	Maintained composure in a difficult situation
Time Management	
14.	Was on time
15.	Completed tasks in a reliable fashion
17.	Was available to colleagues
Interprofessional Relationship Skills	
11.	Maintained appropriate boundaries
13.	Maintained appropriate appearance
16.	Addressed own gaps in knowledge and skills
18.	Demonstrated respect for colleagues
19.	Avoided derogatory language
20.	Maintained patient confidentiality
21.	Used health resources appropriately

C. **Validity Evidence**

Validity evidence for use of the P-MEX scores in the admissions process was based on Messick's unified validity framework: content, response process, internal structure, relationship to other variables, and consequences.²⁶

1. **Content**

The average number of items scored was calculated for each case. Verbal feedback was obtained from applicants and faculty raters after the P-MEX encounter regarding the professionalism content of the cases (see questions, Appendix D). A thematic analysis, using a grounded theory, constant comparative method, was used for the qualitative analyses.

2. **Response process**

Intraclass correlation coefficients (ICC) were calculated to evaluate inter-rater reliability for the SLR, SI, global rating, and P-MEX scores.

3. **Internal structure**

Generalizability and decision studies were performed to estimate variance components and reliability indices of the P-MEX scores.²⁷ Applicants (p) were the object of measurement, with three facets (sources of error variance): raters (r), cases (c), and items on the P-MEX instrument (i). The different fully-crossed sets of data were analyzed using a $p \times c \times r \times i$ design.²⁷

Variance components from different blocks of data (7 fully-crossed data blocks) were aggregated using Brennan's method.²⁸ Details of variance components are beyond the scope of this study. All facets were assumed to be random samples from a population.

4. **Relationship to other variables**

Pearson's correlation coefficient (r) was calculated to measure inter-score associations (SLR, SI, Global rating) to provide convergent validity evidence.

5. **Consequences**

Scores from the SLR, SI, and P-MEX were used as independent variables in a logistic regression model with the final admissions decision as the dependent variable to analyze whether P-MEX scores predict admissions decisions.

Pseudo R-squared was calculated to examine the contribution of predictors in the admissions process with and without P-MEX scores.

D. **Composite Score**

To evaluate the internal structure of the selection process, the magnitude of association between each selection instrument score and the admissions decision (odds ratios from 2012 data) was used to assign weights to the selection instrument scores, which in combination with the reliability of each score, was then used to calculate the composite reliability using Kane's formula for composite reliability (Appendix E).²⁹ Using this formula, a composite score was calculated for each applicant. A threshold composite score was not set a priori.

In 2012, applicants' SLR, SI, and global ratings were presented to the admissions committee. In 2013, the composite score (based on SLR, SI, and P-MEX) and P-MEX score were also presented. In 2012 applicants were grouped based on their global rating. In 2013 each applicant's composite score was used as the starting point for discussion.

A comparison of rankings of applicants based on their global rating (method of ranking prior to 2013) versus their composite score (method of ranking used in 2013) was analyzed using Wilcoxon matched-pairs signed-ranks test, as well as a comparison between the reliability of the composite score with and without the P-MEX score.

Data management and analyses were conducted using Stata 12 (StataCorp, College Station, Texas).

E. **Feasibility**

Feasibility of adding the P-MEX to the admissions process was based on the resources used (faculty effort measured in hours for rater training and assessment of applicants, and the cost for the SPs). Feasibility of using instruments for admissions in 2012 (SLR, SI, and Global rating) was compared to 2013 (SLR, SI, Global rating, and P-MEX).

III. RESULTS

Seventy (70) of 73 applicants participated in the study (3 were unable to participate because of scheduling conflicts), of which 61 were women (87%). Twenty-nine percent (29%, 20/70) were foreign graduates. Fifty-six percent (56%, 39/70) of applicants were in their final year of medical school. The 31 other applicants had already completed some pediatric post-graduate training in other institutions (mean of 1 year; range: 1 to 5 years), which is typical in Switzerland. Proportions for gender, foreign graduates, and years of experience were similar to cohorts in 2010 and 2011. Seventy-four percent (74%, 52/70) had prior experience with SPs.

A. Content

On average, 2.8/21 P-MEX items per encounter (SD=1.70) were not completed or were marked “not applicable”. Items most likely not to be completed were: “admitted error/omissions”, “was available to colleagues”, and “maintained patient confidentiality”. Across cases, the mean number of items not completed varied from 2.3 (case 2, SD=1.46), to 2.6 (case 1, SD=1.63), to 4.1 (case 3, SD=1.55). The mean P-MEX item score was 3.13 out of 4 (SD=0.23). Items most likely to be noted “below expectations” were: “recognized and met patient needs”, “extended his/herself to meet patient or parent needs”, “ensured continuity of patient care”, and “completed tasks in a reliable fashion”.

Both applicants and faculty agreed that the P-MEX was an appropriate method of assessing professionalism. Applicants felt that the SP cases were realistic and prompted them to

reflect on their role in the situation. Applicants also considered the P-MEX to be fairer than other selection instruments because they had the opportunity to show their level of professional competence during live situations. Faculty examiners felt that the P-MEX cases depicted typical challenges in pediatrics. Faculty wished that they could have documented non-verbal communication skills, such as body language. A detailed content analysis of faculty feedback will be conducted in a future study.

B. Response Process

The ICC was 0.51 (SE=0.04) for the SLR, 0.66 (SE=0.07) for the SI, and 0.87 (SE=0.12) for the global rating. The ICC was 0.36 (SE=0.02) for the P-MEX (the proportion of exact agreement between raters was 68% for the P-MEX).

C. Internal Structure

Person variance accounted for 6.8% of total variance in P-MEX scores. The highest proportion of variance (10.1%) came from the interaction of applicants with cases and raters (Table II). The G-coefficient was 0.45 (Phi-coefficient = 0.43). The decision study showed that the G-coefficient increased to 0.6 with 7 cases and to 0.65 with 10 cases.

Table II

GENERALIZABILITY STUDY RESULTS FROM THE 2012 AND 2013 COMBINED P-MEX DATA (N=70)

Effect	Variance Component	%Variance Component
<i>p</i>	0.017	6.8%
<i>c</i>	0.001	0.4%
<i>r</i>	0.001	0.3%
<i>i</i>	0.005	2.1%
<i>p x c</i>	0.025	10.0%
<i>p x r</i>	0.005	2.0%
<i>p x i</i>	0.012	4.7%
<i>c x r</i>	0.000	0.1%
<i>c x i</i>	0.002	0.7%
<i>r x i</i>	0.003	1.0%
<i>p x c x r</i>	0.025	10.1%
<i>p x c x i</i>	0.020	8.0%
<i>p x r x i</i>	0.001	0.6%
<i>c x r x i</i>	0.002	0.9%
<i>p x c x r x i</i>	0.128	52.2%

D. Relationship to Other Variables

P-MEX scores were correlated with SLR scores ($r=0.25$, $P = .036$), SI scores ($r=0.34$, $P = .004$), and global ratings ($r= 0.48$, $P <.001$).

E. Consequences

P-MEX scores were significantly correlated with the acceptance decision ($r=0.56$, $P < .001$).

P-MEX scores were the strongest predictor of acceptance decisions ($OR=4.37$, $P < .001$). In

2012, when P-MEX scores were unavailable to the admissions committee, pseudo R-

squared was 0.10 without P-MEX scores and was 0.25 with P-MEX scores. Pseudo R-

squared for combined 2012 and 2013 admissions data was 0.11 without P-MEX scores and 0.31 with P-MEX scores; see Table III. The increase in pseudo R-squared by 0.20 points indicates an improvement in prediction of acceptance decisions.

Table III

ODDS RATIOS OF SCORES FROM THE SELECTION INSTRUMENTS IN RELATION TO THE ACCEPTANCE DECISION (N=70)

	Accept/Not accept		
	Odds Ratio	Standard Error	P -value
Structured Interview	1.92	.76	.10
Structured Letter of Recommendation	1.22	.42	.56
P-MEX	4.37	1.80	< .001
Pseudo R-squared			.31
Pseudo R-squared (without P-MEX)			.11

F. Composite Score and Reliability

In 2012, weights for each score were derived from odds ratios from the logistic regression: 18% for SLR, 25% for SI, and 57% for P-MEX. The admissions committee found these percentages appropriate and agreed to use them. Composite reliability of the SLR and SI was 0.51. Based on the G and D studies, composite reliability for the selection process with two P-MEX cases was 0.66 and with 3 P-MEX cases 0.74. In 2013, a composite score was calculated for each applicant based on scores from the SLR, SI, and 3 P-MEX cases. Mean composite score for applicants was 0.77 (SD=0.07).

A Wilcoxon signed-rank test comparing rank lists of candidates using the global rating versus composite score in 2013 showed a significant difference in rank ordering of applicants ($z=5.51$, $P < .001$).

G. **Feasibility**

Faculty effort for the SI and global ratings amounted to two faculty hours per applicant. In 2013, the P-MEX required 1.5 hours of faculty rater time per applicant (59 total faculty hours over 5 half days). The cost of SP actors (30CHF or 33USD per hour) included training and performance hours. Cost for the P-MEX amounted to 60CHF or 66USD per applicant. These costs were found to be comparable to the cost of other SP assessments at UGM-PR. Altogether, the 2013 residency admissions process required 3.5 hours of faculty time and cost 66 USD per applicant.

IV. DISCUSSION

Use of the P-MEX with SPs is a novel approach to assessing professionalism during the admissions process. This study has provided validity evidence for the approach through the rigor of the development and administration of the assessment and through the reliability of P-MEX scores. The direct observation of professionalism behaviors provided a more objective assessment and insight into the professionalism competence of applicants compared to other selection instruments. Moderate correlations of P-MEX scores with scores from other selection instruments (0.25 to 0.48) and the increase in pseudo R-squared (0.11 to 0.31), evidence that the P-MEX improves the detection of differences between applicants, indicate that the P-MEX was a useful addition to our pediatric residency admissions process.

P-MEX scores of applicants were the most decisive predictor of admissions decisions (OR=4.37) among selection instrument scores. This finding emphasizes the importance of the assessment of professionalism to the admissions committee and suggests that the admissions committee tried to select applicants that best fit the professional image of a pediatrician even before the addition of the P-MEX to the admissions process. In our admissions process, the P-MEX scores are not used alone but in combination with SI and SLR scores. The composite score derived from these assessments gave the admissions committee a reliable (composite reliability=0.74) and useful measure to guide their decisions compared to the reliability of scores from prior admissions processes and had an impact on the ranking of applicants as shown by the Wilcoxon signed rank test results.

With the implementation of the Next Accreditation System and the Milestone Project by the ACGME, developing and validating useful instruments for resident selection is increasingly important. A high standard of professionalism is expected from the start of residency training.⁵ As such, residency admissions committees need validated tools that can detect applicants who fail to meet professionalism standards. Both the Multiple Mini Interview (MMI) and the Situational Judgment Test (SJT) have been used to measure elements of professionalism in the selection of residents. The P-MEX is unique in that it focuses exclusively on the construct of interest, professionalism, using direct observations of performance in a specialty-specific context. Reliability of scores in our admissions process is comparable to those reported for both the MMI and SJT.^{16,30} The addition of the P-MEX assessment to our existing admissions process facilitated implementation and acceptance by our faculty. In terms of resources, the P-MEX was found to be comparable to other SP assessments and potentially less than the resources needed to remediate a resident in difficulty. Most importantly, the use of the P-MEX assessment in the context of SPs enhanced the fairness of the admissions process in the eyes of the applicants and faculty raters.

Our study was conducted in a single specialty at a single European institution. Future replication studies should include larger and more heterogeneous samples in other settings. Variability in rater scores (rater severity) in the P-MEX were demonstrated in the low ICC (0.36) for the P-MEX; however, the *p x r* of 2% in the G-study indicates that rank orders

would not change dramatically based on which single rater's ratings were used. Ongoing faculty development to improve rater training may increase rater agreement.

There was evidence of case-specificity shown in the $p \times c$ variance of 10%. Even though the SP cases were specifically developed to assess the construct of professionalism, the professionalism performance of the applicant was specific to the conflict of values in the case. This reflects qualitative literature by Ginsburg et al. that have investigated how physicians approach professional dilemmas.³¹ The moderate G-coefficient of 0.45 and D-study results with three cases are evidence of possible construct-underrepresentation; increasing the number of cases will likely increase reliability. Future studies will determine the ideal number of P-MEX raters and P-MEX cases. A detailed content analysis of faculty feedback will be conducted in a future study. The progression of residents' professionalism behaviors will be studied to determine whether the P-MEX was indeed useful in predicting professionalism during and after residency training.

The importance of assessing professionalism during the residency admissions process is manifold. It sends a clear message to applicants that professionalism is important to the pediatrics residency program, documents initial professionalism milestones, improves the overall reliability and validity of the admissions process, and may help prevent professionalism difficulties during residency training. Residency directors may wish to consider using a standardized-patient based P-MEX assessment as an element of their residency admissions process.

V. DISCLOSURES

Acknowledgments: The authors wish to thank Dr. Florence Demaurex for her assistance in training the SPs.

Funding/Support : This study was funded in part by a grant from the Global Pediatric Education Consortium (GPEC).

Other disclosures: None

Ethical approval: This study was approved by the Institutional Review Board at the University Hospital of Geneva and the University of Illinois at Chicago.

Disclaimers: None

Previous presentations: Pilot study results were presented at the Association for Medical Education in Europe (AMEE), August 2013, Prague.

CITED LITERATURE

1. Yao DC, Wright SM. National survey of internal medicine residency program directors regarding problem residents. *Jama*. Sep 6 2000;284(9):1099-1104.
2. Zbieranowski I, Takahashi SG, Verma S, Spadafora SM. Remediation of residents in difficulty: a retrospective 10-year review of the experience of a postgraduate board of examiners. *Acad Med*. Jan 2013;88(1):111-116.
3. Adams KE, Emmons S, Romm J. How resident unprofessional behavior is identified and managed: a program director survey. *Am J Obstet Gynecol*. Jun 2008;198(6):692 e691-694; discussion 692 e694-695.
4. Stern DT. *Measuring medical professionalism*. Oxford ; New York: Oxford University Press; 2006.
5. Nasca T. Graduate Medical Education in the United States. Vision and General Directions for the Next Ten Years.; November 7, 2010; Washington D.C.
6. Hodges BD, Ginsburg S, Cruess R, et al. Assessment of professionalism: recommendations from the Ottawa 2010 Conference. *Med Teach*. 2011;33(5):354-363.
7. Goldie J. Assessment of professionalism: A consolidation of current thinking. *Med Teach*. Sep 3 2012.
8. Rodriguez E, Siegelman J, Leone K, Kessler C. Assessing professionalism: summary of the working group on assessment of observable learner performance. *Acad Emerg Med*. Dec 2012;19(12):1372-1378.
9. Durning SJ, Pangaro LN, Lawrence LL, Waechter D, McManigle J, Jackson JL. The feasibility, reliability, and validity of a program director's (supervisor's) evaluation form for medical school graduates. *Acad Med*. Oct 2005;80(10):964-968.
10. Brenner AM, Mathai S, Jain S, Mohl PC. Can we predict "problem residents?". *Meeting of the American Association of Directors of Psychiatry Residency Training, 2007, San Juan, Puerto Rico; The results of this study were presented in a workshop at the aforementioned conference*. 2010;85(7):1147-1151.
11. Olawaiye A, Yeh J, Withiam-Leitch M. Resident selection process and prediction of clinical performance in an obstetrics and gynecology program. *Teach Learn Med*. Fall 2006;18(4):310-315.
12. Swanson WS, Harris MC, Master C, Gallagher PR, Mauro AE, Ludwig S. The impact of the interview in pediatric residency selection. *Ambul Pediatr*. Jul-Aug 2005;5(4):216-220.
13. Metro DG, Talarico JF, Patel RM, Wetmore AL. The resident application process and its correlation to future performance as a resident. *Anesthesia and analgesia*. Feb 2005;100(2):502-505.
14. Papp K, Polk H, Richardson J. The relationship between criteria used to select residents and performance during residency. *Am J Surg*. 1997;173:326 - 329.
15. Greenburg DL, Durning SJ, Cohen DL, Cruess D, Jackson JL. Identifying medical students likely to exhibit poor professionalism and knowledge during internship. *J Gen Intern Med*. Dec 2007;22(12):1711-1717.

16. Dore KL, Kreuger S, Ladhani M, et al. The reliability and acceptability of the Multiple Mini-Interview as a selection instrument for postgraduate admissions. *Acad Med*. Oct 2010;85(10 Suppl):S60-63.
17. Eva KW, Reiter HI, Trinh K, Wasi P, Rosenfeld J, Norman GR. Predictive validity of the multiple mini-interview for selecting medical trainees. *Med Educ*. Aug 2009;43(8):767-775.
18. Cruess R, McIlroy JH, Cruess S, Ginsburg S, Steinert Y. The Professionalism Mini-evaluation Exercise: a preliminary investigation. *Acad Med*. 2006;81(10 Suppl):S74-78.
19. Norcini JJ, Blank LL, Arnold GK, Kimball HR. The mini-CEX (clinical evaluation exercise): a preliminary investigation. *Ann Intern Med*. Nov 15 1995;123(10):795-799.
20. Wilkinson TJ, Wade WB, Knock LD. A blueprint to assess professionalism: results of a systematic review. *Acad Med*. May 2009;84(5):551-558.
21. Tsugawa Y, Ohbu S, Cruess R, et al. Introducing the Professionalism Mini-Evaluation Exercise (P-MEX) in Japan: results from a multicenter, cross-sectional study. *Acad Med*. Aug 2011;86(8):1026-1031.
22. Swanwick T, Association for the Study of Medical Education. *Understanding medical education : evidence, theory and practice*. 1st ed. Chichester, West Sussex: Wiley-Blackwell; 2010.
23. Randall R, Davies H, Patterson F, Farrell K. Selecting doctors for postgraduate training in paediatrics using a competency based assessment centre. *Arch Dis Child*. May 2006;91(5):444-448.
24. Swiss Catalogue of Learning Objectives for Undergraduate Medical Training. Working Group under a Mandate of the Joint Commission of the Swiss Medical Schools; 2008.
25. Demaurex F VN. Patients simulés/ standardisés. In: Granry GSaJ, ed. *La simulation en santé: De la théorie à la pratique*. Paris: Springer Verlag; 2013.
26. Messick S. Standards of validity and the validity of standards in performance assessment. *Educational Measurement: Issues and Practice*. 1995;14(4):5-8.
27. Brennan RL. *Generalizability Theory*. Springer; 2001.
28. Brennan RL, Gao X, Colton DA. Generalizability Analyses of Work Keys Listening and Writing Tests. *Educational and Psychological Measurement*. April 1, 1995 1995;55(2):157-176.
29. Kane M, Case SM. The reliability and validity of weighted composite scores. *Applied Measurement in Education*. 2004;17(3):221-240.
30. Patterson F, Ashworth V, Zibarras L, Coan P, Kerrin M, O'Neill P. Evaluations of situational judgement tests to assess non-academic attributes in selection. *Med Educ*. Sep 2012;46(9):850-868.
31. Ginsburg S, Bernabeo E, Ross KM, Holmboe ES. "It Depends": Results of a Qualitative Study Investigating How Practicing Internists Approach Professional Dilemmas. *Acad Med*. Dec 2012;87(12):1685-1693.

APPENDICES

APPENDIX A Blueprint for the Residency Admissions Process Based on Competency Domains

Assessment Method	Cognitive or Non-Cognitive	PIR	ES	PA	CS	TW	LPD	CP	POA	VSA	CTK	CT	LEP	MO	TE
Medical School Transcript and Evaluations	C						✓		✓		✓	✓			
Federal Exam Test Scores	C										✓	✓			
SLR	NC	✓		✓	✓		✓		✓					✓	✓
SI	NC	✓	✓	✓	✓	✓		✓		✓			✓		
P-MEX	NC	✓	✓		✓	✓		✓	✓	✓	✓	✓		✓	

Competency Domains
Professional integrity and respect for others (PIR)
Empathy and Sensitivity (ES)
Personal Attributes (PA)
Communication skills (CS)
Team work (TW)
Learning and personal development (LPD)
Coping with pressure (CP)
Personal organization and administration skills (POA)
Vigilance and situational awareness (VSA)
Clinical/Technical knowledge and expertise (CTK)
Conceptual thinking problem solving, and decision making (CT)
Legal, ethical, and political awareness (LEP)
Managing others (MO)
Teaching (TE)

APPENDIX B Sample Structured Letter of Recommendation

**University of Geneva, Pediatric Residency Recommendation Form
2012-2013**

Applicant's Name:

Reference Provided By:

Present Position:

Email:

Institution:

Telephone Number:

A. Background Information

1. How long have you known the applicant?

2. Nature of contact with applicant: (Check all that apply)

- | | | | |
|--|--------------------------|---|--------------------------|
| Know indirectly through
others/evaluations | <input type="checkbox"/> | Extended, direct observation >10
hours | <input type="checkbox"/> |
| Clinical contact outside the Hospital | <input type="checkbox"/> | Advisor | <input type="checkbox"/> |
| Occasional contact (< 10 hours) in the
Hospital | <input type="checkbox"/> | Other | |

3. If this candidate rotated in your service, what grade was given?

3 Honors (concerns typically 10 to 20% of students)

2 Pass (concerns the majority of students)

1 Needs Improvement (advised to work on specific objectives)

Optional: One Key Comment from Faculty Evaluations:

B. Qualifications for Pediatrics. Compare the applicant to other Pediatric applicants/peers.

1. Demonstrates professional integrity and respect for others.

Outstanding (top 10%)

Excellent (top 1/3)

Very Good (middle 1/3)

Good (lower 1/3)

APPENDIX B (continued)

Please indicate if you have observed the following undesirable behaviors:

	YES	NO
Lack of collegiality	<input type="checkbox"/>	<input type="checkbox"/>
Serious mistakes in or lack of documentation	<input type="checkbox"/>	<input type="checkbox"/>
Excessive absences	<input type="checkbox"/>	<input type="checkbox"/>
Inconsistent presence at lectures	<input type="checkbox"/>	<input type="checkbox"/>

2. Demonstrates scientific curiosity and motivation to learn.

Outstanding (top 10%) Excellent (top 1/3)

Very Good (middle 1/3) Good (lower 1/3)

3. Ability to manage patients and develop care plans in a consistent manner.

Outstanding (top 10%) Excellent (top 1/3)

Very Good (middle 1/3) Good (lower 1/3)

4. Organization: Ability to work autonomously and be organized in clinical work and training

Outstanding (top 10%) Excellent (top 1/3)

Very Good (middle 1/3) Good (lower 1/3)

5. Collaboration: Multidisciplinary and interprofessional collaboration

Outstanding (top 10%) Excellent (top 1/3)

Very Good (middle 1/3) Good (lower 1/3)

APPENDIX B (continued)

6. Communication skills: ability to effectively communicate with patients and colleagues

Outstanding (top 10%)

Excellent (top 1/3)

Very Good (middle 1/3)

Good (lower 1/3)

C. Overall Assessment

1. Compared to other Pediatric residency applicants you have recommended as such last academic year, this candidate is ranked as:

Ranking

Recommended as such last academic year

Outstanding (top 10%)

Excellent (top 1/3)

Very Good (middle 1/3)

Good (lower 1/3)

D. Written Comments

APPENDIX C Examples of Structured Interview Questions and Possible Responses

Competencies: Ability to handle stress, personal organization Need to translate the definition of the competencies		
Question: How do you react when faced with constant time pressure? Give an example.		
Proficiency Level	Definition	Question-Specific Behavioral Examples
Level 5 Expert	Applies the competency in exceptionally difficult situations Serves as a key resource and advises others	Able to prioritize tasks for self and others. Able to delegate effectively in high stress situations (e.g. Codes)
Level 4 Proficient	Applies the competency in considerably difficult situations Generally requires little or no guidance	Able to prioritize tasks for self. Able to delegate in moderately stressful situations (e.g. emergency room)
Level 3 Competent	Applies the competency in difficult situations Requires occasional guidance	Able to prioritize tasks for self autonomously (e.g. while on-call at night). When unsure of priorities will ask for assistance from a senior person.
Level 2 Advanced Beginner	Applies the competency in somewhat difficult situations Requires frequent guidance	Able to prioritize tasks for self with some guidance (e.g. prioritizing tasks during ward rounds with the help of a senior resident).
Level 1 Novice	Applies the competency in the simplest situations Requires close and extensive guidance	Asks for help regularly when deciding the order of priority for tasks.

APPENDIX D Questions Used to Gather Feedback From Applicants and Faculty Examiners Regarding the P-MEX Exercise

Interview of Applicants

1. What was the experience like for you?
2. How true-to-life were the situations? In what sense?
3. Tell me about a time when you were confronted with a similar situation? (prior experiences with professionally challenging situations)
4. If you were asked to repeat the exercise, what would you have done differently?
(Lessons learned from the experience)

Interview of Faculty Examiners

The following questions were asked of the examiners after their final standardized patient session:

1. How useful was the P-MEX in assessing the professionalism of the candidate?
2. In general, what were your impressions of the overall level of applicants' professionalism?
3. How true-to-life were the situations? In what sense?
4. How difficult were the standardized patient stations? What differences, if any, did you notice in the difficulty level between the two cases?
5. How difficult was it to use the P-MEX evaluation form? Did you feel more comfortable with the evaluation form after evaluating a certain number of applicants? Why?
6. How well were you able to differentiate the applicants based on the P-MEX evaluation form?

APPENDIX E Kane's formula for the calculation of composite reliability of the selection process¹

Weighting of the instruments based on OR found in the logistic regression regarding acceptance rates.

	OR	Percentage Weight
Structured Interview (SI)	1.5	25%
Structured Letter of Recommendation (SLR)	1.1	18%
P-MEX	3.4	57%

1. Calculate the squared sum of the weights associated with each assessment:
 $(\text{weight of assessment 1})^2 + (\text{weight of assessment 2})^2 + (\text{weight of assessment 3})^2$
 $= (.25)^2 + (.18)^2 + (.57)^2$
 $= 0.0625 + 0.0324 + 0.3249$
 $= 0.42$

2. Calculate the weighted sum of the correlations:

	Correlation between assessments
SI and SLR	0.27
SLR and P-MEX	0.37
SI and P-MEX	0.36

$(2 \times \text{product of weights from assessments 1 and 2} \times \text{correlation of assessments 1 and 2}) + (2 \times \text{product of weights from assessments 1 and 3} \times \text{correlation of assessments 1 and 3}) + (2 \times \text{product of weights from assessments 2 and 3} \times \text{correlation of assessments 2 and 3}) =$

$$= (2 \times 0.25 \times 0.18 \times 0.27) + (2 \times 0.25 \times 0.57 \times 0.36) + (2 \times 0.18 \times 0.57 \times 0.37)$$

$$= (0.0243) + (0.1026) + (0.0759)$$

$$= 0.20$$

3. Total variance of the composite score is step 1 + step 2
 $= 0.42 + 0.20$
 $= 0.62$

APPENDIX E (continued)

4. Calculate the product of the reliability with the squared weights of the assessment and take their sum:

	G Coefficient
SI	0.85
SLR	0.86
P-MEX	0.44 (.54)

$$\begin{aligned}
 & (\text{reliability of assessment 1}) \times (\text{weight of assessment 1})^2 + (\text{reliability of assessment 2}) \times (\text{weight of assessment 2})^2 + (\text{reliability of assessment 3}) \times (\text{weight of assessment 3})^2 \\
 & = (0.85 \times 0.0625) + (0.86 \times 0.0324) + (0.54 \times 0.3249) \\
 & = 0.0531 + 0.0278 + 0.1754 \\
 & = 0.26
 \end{aligned}$$

5. Sum the result in step 4 with step 2= true variance of the composite score
 $= 0.26 + 0.2$
 $= 0.46$
6. Divide the result from step 5 by the result in step 3 (true score variance/total score variance)=
 $= 0.46/0.62$
 $= 0.74$

Based on these calculations, the composite score reliability of the 3 assessments is **0.66 with 2 P-MEX cases.**
0.74 if 3 cases for the P-MEX are used.

1. Kane M, Case SM. The reliability and validity of weighted composite scores. *Applied Measurement in Education*. 2004;17(3):221-240.

APPENDIX F University of Illinois at Chicago IRB ExemptionUNIVERSITY OF ILLINOIS
AT CHICAGO

Office for the Protection of Research Subjects (OPRS)
Office of the Vice Chancellor for Research (MC 672)
203 Administrative Office Building
1737 West Polk Street
Chicago, Illinois 60612-7227

Exemption Granted

September 4, 2013

Nadia Bajwa, MD
Medical Education
Rue Willy-Donze 6
CH-1211 Geneve 14, Switzerland
Phone: (216) 255-6628 / Fax: +41 (0)22 382 4577

RE: Research Protocol # 2013-0838

“Assessing the professionalism of pediatric residency applicants: Validity and Feasibility evidence for the Professionalism Mini-Evaluation Exercise”

Sponsor: Global Pediatric Education Consortium
PAF#: Not applicable
Grant/Contract No: Not applicable
Grant/Contract Title: GPEC Medical Education Investigator Grant

Dear Dr. Bajwa:

Your Claim of Exemption was reviewed on September 4, 2013 and it was determined that your research protocol meets the criteria for exemption as defined in the U. S. Department of Health and Human Services Regulations for the Protection of Human Subjects [(45 CFR 46.101(b))]. You may now begin your research.

Exemption Period: September 4, 2013 – September 4, 2016
Lead Performance Site: University of Geneva
Other Performance Site(s): UIC
Subject Population: Adult subjects only
Number of Subjects: Total = 70; UIC = 0

The specific exemption categories under 45 CFR 46.101(b) are:

(1) Research conducted in established or commonly accepted educational settings, involving normal educational practices such as (i) research on regular and special education instructional strategies, or (ii) research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods; and

APPENDIX F (continued)

(4) Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects.

You are reminded that investigators whose research involving human subjects is determined to be exempt from the federal regulations for the protection of human subjects still have responsibilities for the ethical conduct of the research under state law and UIC policy. Please be aware of the following UIC policies and responsibilities for investigators:

1. Amendments You are responsible for reporting any amendments to your research protocol that may affect the determination of the exemption and may result in your research no longer being eligible for the exemption that has been granted.
2. Record Keeping You are responsible for maintaining a copy all research related records in a secure location in the event future verification is necessary, at a minimum these documents include: the research protocol, the claim of exemption application, all questionnaires, survey instruments, interview questions and/or data collection instruments associated with this research protocol, recruiting or advertising materials, any consent forms or information sheets given to subjects, or any other pertinent documents.
3. Final Report When you have completed work on your research protocol, you should submit a final report to the Office for Protection of Research Subjects (OPRS).
4. Information for Human Subjects UIC Policy requires investigators to provide information about the research protocol to subjects and to obtain their permission prior to their participating in the research. The information about the research protocol should be presented to subjects in writing or orally from a written script. When appropriate, the following information must be provided to all research subjects participating in exempt studies:
 - a. The researchers affiliation; UIC, JBVMAC or other institutions,
 - b. The purpose of the research,
 - c. The extent of the subject's involvement and an explanation of the procedures to be followed,
 - d. Whether the information being collected will be used for any purposes other than the proposed research,
 - e. A description of the procedures to protect the privacy of subjects and the confidentiality of the research information and data,
 - f. Description of any reasonable foreseeable risks,
 - g. Description of anticipated benefit,
 - h. A statement that participation is voluntary and subjects can refuse to participate or can stop at any time,

APPENDIX F (continued)

- i. A statement that the researcher is available to answer any questions that the subject may have and which includes the name and phone number of the investigator(s).
- j. A statement that the UIC IRB/OPRS or JBVMAC Patient Advocate Office is available if there are questions about subject's rights, which includes the appropriate phone numbers.

Please be sure to:

→Use your research protocol number (listed above) on any documents or correspondence with the IRB concerning your research protocol.

We wish you the best as you conduct your research. If you have any questions or need further help, please contact me at (312) 355-2908 or the OPRS office at (312) 996-1711. Please send any correspondence about this protocol to OPRS at 203 AOB, M/C 672.

Sincerely,

Charles W. Hoehne
Assistant Director
Office for the Protection of Research Subjects

cc: Ilene B. Harris, Medical Education, M/C 591
Yoon Soo Park, Medical Education, M/C 591

APPENDIX G University of Geneva IRB Exemption



Commission centrale d'éthique de la
recherche sur l'être humain des HUG

Dre Nadia BAJWA
Service de Pédiatrie Générale
Département de l'Enfant et de
l'Adolescent
H.U.G.

N/ref. : 01/pd

Geneve, le 23 mars 2012

Concerne : Demande d'exemption de revue par la Commission Centrale d'Ethique de la Recherche sur l'être humain des HUG pour l'étude "The Professionalism Mini-Evaluation Exercise (P-MEX)".

Madame et Chere Collegue,

J'ai bien regu votre courrier du 6 mars 2012 dans lequel vous demandez une exemption de revue de l'étude susmentionnée par la Commission Centrale d'Ethique de la Recherche sur l'être humain des HUG (CCER).

Je vous confirme que cette étude n'a pas à être soumise à la CCER. Je vous demande de modifier le formulaire d'information aux candidats/internes en retirant la phrase : « Cette étude a été soumise et acceptée par le Comité d'Ethique des Hopitaux Universitaires de Genève. »

Je vous prie d'agréer, Madame et Chere Collegue, mes meilleures salutations.

Prof. Olivier IRION
President CCE

Adresse postale: Commission Centrale d'Ethique de la Recherche des HUG-Hopital Universitaire
Bd de la Cluse 81, 1^{er} étage (78-1-251)- CH-1211 Geneve 14 - Suisse
Te1(+41-22)-3729919 - Fax(+41-22)-3729020- e-maii:Ethique.R.CommissionCentrale@hcuge.ch

APPENDIX G (continued)

Geneve, le- 19 fevrier 2013



Commission centrale d'ethique de la
recherche sur l'etre humain des HUG

Dre Nadia BAJWA
Service de Pediatrie Generale
Departement de l'Enfant et de
l'Adolescent
H.U.G.

Concerne : Demande d'une exemption de revue par la CEREH pour l'etude :
*Improving the reliability and validity of the resident selection
process with the professionalism mini-evaluation exercise*

Cher
Collegue,

Je vous remercie pour votre lettre du 8 fevrier 2013. Je vous confirme que
l'etude susnommee n'a pas besoin d'une approbation prealable par la Commission
d'Ethique selon la legislation actuelle.

Avec mes meilleures
salutations.

Professeur Bernard
HIRSCHEL President

Adresse postale: Commission d'Ethique de la Recherche des HUG – H6pital
Universitaire
Bd de la Cluse 81, 1^e etage (78-1-251)- CH-1211 Geneve 14-
Suisse
Tel(+41-22)-3729919- Fax(+41-22)-3729020- e-mail:
RechercheEtreHumain.CommissionEthique@hcuge.ch

VITA

NAME: Nadia M. Bajwa

EDUCATION:

2014	Masters of Health Professions Education, University of Illinois at Chicago	Chicago, Illinois, U.S.A.
2011	Swiss Federal Diploma of Medicine	Bern, Switzerland
2004	The Cleveland Clinic Foundation Pediatric Residency American Board of Pediatrics certified	Cleveland, Ohio, U.S.A.
1997-2001	Northeast Ohio Medical University Medical Doctor, M.D.	Rootstown, Ohio, U.S.A.
1997	Kent State University Geneva Study Abroad Program	Geneva, Switzerland
1996	Northwestern University	Chicago, Illinois, U.S.A.
1994-1996	Kent State University Bachelors of Science (B.S.), Integrated Life Sciences. Completed in conjunction with a six year accelerated and combined B.S. /M.D. program.	Kent, Ohio, U.S.A.

TEACHING:

2006-Present	Hôpital des Enfants, Hôpitaux Universitaires de Genève Clinical Instructor	Geneva, Switzerland
2004-2005	The Children's Hospital, The Cleveland Clinic Foundation Chief Resident	Cleveland, Ohio, U.S.A.

ACADEMIC DISTINCTIONS AND AWARDS:

2009	Appointed to Physician Responsible for the Residency Training Program at the Hôpital des Enfants.	Geneva, Switzerland.
------	---	----------------------

2004	Appointed to Chief Resident at the Cleveland Clinic Foundation	Cleveland, Ohio, U.S.A
2003	Appointed to Assistant Chief Resident at the Cleveland Clinic Foundation	Cleveland, Ohio, U.S.A
	Humanitarian Award at the Annual Douglas S. Moodie Research Day	
2002	Cardiology Intern of the Year for the Cleveland Clinic Foundation Center for Pediatric and Congenital Heart Disease	Cleveland, Ohio, U.S.A
	Nominated for the Graduate Level One Award presented by the Cleveland Clinic Foundation Alumni Association	

PROFESSIONAL MEMBERSHIP:

2009- Present	Committee for the Clinical Skills Assessment, Switzerland Association for Medical Education in Europe, Member
2006-Present	Société Suisse de Pédiatrie, Member FMH Swiss Medical Association,
2004-Present	Fellow of the American Academy of Pediatrics
2001-2005	American Academy of Pediatrics, CATCH Program, Grant Reviewer American Academy of Pediatrics, Residents Section, District V Representative Women's Professional Staff Association

ABSTRACTS:

2013	Anastaze Stelle K, Mornand A, Bajwa N, Vidal I, Dumont M, Barazzone-Argiroffo C, Blanchon S. "Should empyema with or without necrotizing pneumonia in children be managed differently?" Swiss Medical Weekly. 143 (S197): S37-S38.
	Blanchon S, Anastaze Stelle K, Bajwa N, Corbelli R, Guinand S, Lenaud AV, Mornand A, Barazzone Argiroffo C. Hospitalized lung infection in children: a 6-years observational study in Geneva. Swiss Medical Weekly. 143 (S197): S38-S38.

- 2012 Rock N., Belli D., Bajwa N. "Atypical Skin Complications of Mycoplasma Pneumoniae ." Swiss Medical Weekly. 142 (S192): 36S-36S. Impact Factor 1.821.
- 2011 Ziegler L., Korff C., Diana A., Bajwa N. "Exanthem subitum may not always be benign." Swiss Medical Weekly. 141(S187): 50S-50S.
- 2010 Ruchonnet-Métraiiller I, Vaujois L, Uldry V, Bajwa NM. "Kawasaki cardiogenic shock." Swiss Medical Weekly 140 (S180): 13S-13S.
- Ruchonnet-Métraiiller I, Schäppi M, Mourier O, Kanavaki I, Bajwa NM. "Miracles Don't Always Come in Bottles." Swiss Medical Weekly. 140 (S180): 25S-25S.
- Delcò C, Bajwa NM, Cimasoni L, Ansari M. "Hemophagocytic Lymphohistiocytosis (HLH) as the initial presentation of Hodgkin lymphoma (HD)." Swiss Medical Weekly.140 (S180): 25S-26S.
- 2008 Gebdistorf F, Bajwa NM. "Post-Kawasaki disease arthritis." Swiss Medical Weekly.138 (S164): 45S-45S.

PUBLICATIONS:

- 2013 Rock N., Belli D., Bajwa N. Erythema Bullous Multiforme: A Complication of Mycoplasma Pneumoniae Infection. The Journal of Pediatrics. 2013, Nov. 16.
- 2011 Bajwa, NM, Berner M, Worley S, Pfister RE. Population based and age stratified major neonatal morbidities in Switzerland. Swiss Med Wkly. 2011;141:w13212.
- 2010 Bajwa, NM, Belli, D. Index of Suspicion: Erythematous Papulovesicular Rash in a 3-month-old Girl. Pediatrics in Review. 2010; 31: 519-524.
- Lacroix LE, Vunda A, Bajwa NM, Galetto-Lacour A, Gervaix A. Catheterization of the Urethra in Male Children. New England Journal of Medicine. 2010 Sep 30;363(14).
- 2007 Rolston D, Nielsen C, Jacob J, Bajwa NM, Lascano M. *Rapid Review USMLE Step 3*. Chapter on Pediatrics. Copyright 2007.
- 2004 Bajwa NM, Mostow EN, Schwartz RM. *Rapidly Expanding Lesion in a Giant Congenital Melanocytic Nevus*. Clinical Pediatrics. 2003 Jun: 42 (5): 455-8.

