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**Accreditation Council for
Graduate Medical Education**

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ACGME's mission is to improve health care and population health. We do this together by advancing the quality of resident physicians' education and monitoring that quality through accreditation. The Milestones have been identified as a key component of this process, as they allow for continuous tracking of skills development and competency of resident/fellow physicians throughout their training. The document presented here reports a national summary of Milestones data for the academic year July 2016-June 2017.

We wish to acknowledge your efforts in developing and managing systems for teaching and collecting Milestones data.

Early validity research in emergency medicine, family medicine, internal medicine, pediatrics, and neurological surgery has been published. These studies are promising and help to provide early insights into the benefits and challenges of using the Milestones. Additional research projects are underway as part of ongoing collaborative efforts to determine the best way to interpret these data and how to use them to improve graduate medical education for residents and fellows. We will continue to work with program director groups and other key stakeholders to determine the best strategies for interpretation of these data and their use to improve curriculum and assessment processes.

Thank you for your support in this process and for continuing to collaborate with us to make this assessment process efficient, and to make the data truly reflective of your residents' and/or fellows' competence.

Finally, please consult the resources and tools available on the ACGME website for more information. These include the *Milestones Guidebook*, Milestones FAQs, and the recently updated *Clinical Competency Committee Guidebook*, all available on the Milestones section of the ACGME website. Resources are regularly added to the website, so check back frequently.

Sincerely,
The Milestones Team



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Executive Summary

The ACGME's mission is to improve health care and population health by advancing the quality of resident physicians' education through accreditation. Since 2012, the Milestones have been identified as a key component of this process, as they allow for continuous tracking of skills development and competency of resident and fellow physicians throughout their graduate medical education.

The ACGME has now been collecting Milestones data on all resident and fellow physicians since 2015. This report is a snapshot of Milestones ratings from June 2017. With this report, the ACGME intends to highlight both central tendencies and meaningful variation in Milestones ratings within specialties.

Overarching Themes

- 1) Across all specialties, the central tendency of the data show general attainment of the Milestones across years in program.
- 2) There is also variation in attainment of the Milestones across residents/fellows and programs, which needs to be investigated further.

How to Use These Findings

National-level data are presented within each specialty, with an indication of variance among residents/fellows within that specialty. Program directors should be able to compare their individual program's data with the national trends presented here.

Intended Audience

The intended audience for this report includes program directors, leaders within specialty societies who oversee the development of national curricula, Review Committees that oversee accreditation of individual programs, and the residents and fellows within these programs. Future reports will be developed for other stakeholder groups, such as specialty boards, designated institutional officials (DIOs), policymakers, and the public.

Much of the data in this report have already been shared with specialty societies, program director associations, and focus groups of program directors at educational and academic conferences.

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Background

Milestones in the Broader Context of Competency-Based Medical Education

In 2012, the ACGME introduced the Next Accreditation System (NAS) for improving graduate medical education (GME).¹ This evolution in the accreditation model is intended to help address the changing health care needs of the population, to directly address the Institute for Healthcare Improvement (IHI) Triple Aim, and to improve educational and clinical outcomes.¹⁻³

An important component of the NAS is a shift towards competency-based medical education. The use of the educational Milestones is seen as a way to facilitate the transformation from a process-bound system of GME accreditation to one that focuses on educational and clinical outcomes. An outcomes-based training system has the potential to better prepare physicians for a changing health care system by emphasizing a focus on the abilities of graduating residents and fellows and ensuring they match patient and health care system needs.⁴⁻⁶

The educational Milestones allow for continuous monitoring and quality improvement for GME. Specialties (and individual programs) can now focus on making improvements that align with the specific competencies outlined by the Milestones within their specialty, up to the point of graduation. This will help to ensure that graduates from these programs meet the expected standards of the profession and the goal of unsupervised practice.

Meeting the Challenge of Professional Self-Regulation

Tracking of Milestones data for individual residents and fellows is an essential part of the commitment of the ACGME to meet the responsibility of self-regulation,^{1,3,7} and the expectations for quality and safety from its primary stakeholder, the public. It is important to note that the primary goal of the ACGME continues to be accreditation of institutions and residency and fellowship programs and ensuring the quality of those institutions and programs. The collection of individual residents' and fellows' Milestones data will only be used in aggregate form by the ACGME to address this goal. The ACGME will continue to collaborate with the American Board of Medical Specialties (ABMS), the American Osteopathic Association (AOA), and the various specialty boards toward ensuring high quality graduates and maintaining the public trust.

Using Milestones Data to Provide Useful Feedback to Programs

The spirit of the NAS implies an educational continuous quality improvement (CQI) framework. The collection, sharing, and interpretation of Milestones data allows for refinement of policies and accreditation standards for effective education and training. These data will provide the empirical basis for working with specialty groups and programs that may require guidance to meet the expectations set out in the NAS and the IHI Triple Aim. In essence, the field must work together to ensure residents and fellows are ready for unsupervised practice following graduation, and the Milestones can provide detailed guidance for achieving this goal.

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Development of the Milestones

Individual milestones were developed based on sub-competencies within each specialty.⁸ The process of creating these detailed developmental markers of progression involved over 916 subject matter experts from 250 institutions. The Milestones Working Groups included members of the ACGME Review Committees, representatives from the ABMS member certification boards, program directors, residents and fellows, and representatives from specialty societies. These subject matter experts were guided by Advisory Groups from the ACGME, as well as a survey of program directors on content.

While most of the groups were very familiar with the traditional competencies of Medical Knowledge and Patient Care, there was a concerted attempt to meet the larger health care needs of the population and the IHI Triple Aim by expanding and specifying in detail competencies relating to Practice-Based Learning and Improvement, Systems-Based Practice, Professionalism, and Interpersonal and Communication Skills.

Working Groups were instructed to develop the specific Milestones and establish a recommended graduation target using a developmental framework of skills acquisition, usually progressing explicitly from Level 1-5.⁴⁻⁵ The Milestones were written largely independently by ACGME-accredited specialties and their associated subspecialties, covering the six Core Competencies, and resulting in an average of 24 subcompetencies per specialty (range 10-43), with training periods that range from single-year fellowships to residency programs lasting seven years. This complexity precludes the development of a single approach to data analysis and interpretation.

The Role of Key Stakeholders in Meaningful Interpretation of the Milestones Data

To make sense of such a large and complex dataset, these data are being presented first to a key stakeholder group, residency/fellowship program directors and leaders of specialty societies, to assist in constructing meaningful interpretation with the goal of improving GME. By taking the perspective of the needs of key stakeholders, success in this endeavor will depend more on how these stakeholders *interpret* the data than how they are summarized and analyzed. In other words, the effectiveness of Milestones data in achieving the vision of the NAS depends as much on understanding the context in which the data are analyzed, and the dialogue with stakeholders regarding proper *interpretation*, as it does on in-house strategies for analysis. This is consistent with recent advances in the field of Implementation Science.⁹

A Call to Action for Program Directors

Program directors and specialty societies represent the best source of information for understanding what these data represent. Without the rich contextual knowledge, the ACGME can only speculate and offer generalized interpretations based on theory or insights from other areas of application. It would be most helpful if program directors considered in detail what might explain the observed patterns in the data reported in Tables 4-143, and share this with their respective wider community, including other program directors, leaders in the relevant specialty society, and the ACGME Milestones team in order to ensure the data are interpreted properly and ultimately fulfill their potential to improve GME.

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How to Use These Findings

Two particularly important items to highlight in this Milestones Annual Report relate to guiding changes in curriculum and the development of better assessment methods. As can be seen in the data presented in Tables 4-143, there are competency areas where the range of Milestone attainment is wide. Gaps in curriculum and effective assessment are significant contributors to the observed variation in these early findings. This should be viewed as welcome news, as it is an early signal the Milestones data are providing useful information to drive continuous quality improvement (CQI) in GME. The importance of these purposes and goals in these early phases of the Milestones rollout cannot be overstated.

Constituency or Stakeholder	Purpose/Function
Residents and Fellows	<ul style="list-style-type: none"> • Provide a descriptive roadmap for training • Increase transparency of performance requirements • Encourage informed self-assessment and self-directed learning • Facilitate better feedback to trainee
Residency and Fellowship Programs	<ul style="list-style-type: none"> • Guide curriculum and assessment tool development • Provide meaningful framework for the Clinical Competency Committee (CCC) (e.g., help create shared mental model) • Provide more explicit expectations of residents and fellows • Enhance opportunity for early identification of under-performers
ACGME and the Public	<ul style="list-style-type: none"> • Public Accountability – report at an aggregated national level on competency outcomes • Build community for evaluation and research, with focus on continuous quality improvement
Certification Boards	<ul style="list-style-type: none"> • Enable ongoing research to improve certification processes

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Methods

Every six months, the ACGME receives over 2.8 million data points based on performance assessments of over 130,000 learners from residency and fellowship programs in over 150 specialties and subspecialties across the US. The sheer size and complexity of this dataset make it impossible to provide general statements about resident or fellow progression and suggestions for educational CQI for individual residency or fellowship programs.

Ongoing Development of Strategies for Interpretation

The Department of Milestones Research and Evaluation regularly consults with advisory groups composed of leading experts in medical education from across the country to help develop strategies for analysis and interpretation of the data and the processes that lead to Milestones ratings and reporting.

It is useful here to consider that a resident's or fellow's competence in a particular aspect of clinical practice is the target construct that should be represented in the Milestones data. Thus, to interpret Milestones data correctly, there must be assurances that the data accurately represent a resident's or fellow's competence, instead of other variables that might influence the Milestone ratings, including curriculum factors, quality of assessment tools, and the ability to observe the resident or fellow in the variety of clinical settings that make up that individual's educational and training experience in a complex clinical environment. All of these factors can affect current Milestone judgments. Examining the data in Tables 4-143 in terms of "learning curves" of gradual progression of competence shows that:

- there is variation in Milestone attainment across specialties and competencies; and,
- not all residents/fellows in all programs reach Level 4 in all competencies by graduation.

There are likely several possible reasons for this, including:

- differences in the complexity of the Milestones competency language as originally written for that specialty;
- differences in clinical exposure of some residents in some programs;
- variation in scoring by raters;
- differences in the quality of assessment rating forms; or,
- differences in the types of assessment methods used to show attainment of the Milestones.

Strategies for Communication and Implications for Change

Of course, many other factors may be at play, and these are the subject of intensive, ongoing research. Until this research is mature, the data should only be reported in the context of interpretive statements and assumptions that are relevant to the particular

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stakeholder group, (i.e., DIOs, program directors, residents/fellows, the public). In communicating the results of Milestones analysis, there must be full awareness of the consequences of the analysis and communication, which implies diligence in providing context and guidance for interpretation when presenting these results.^{10,11}

Overarching Themes

- 1) Nearly all programs are reporting Milestones data every six months to the ACGME (for the latest period, the reporting rate was greater than 99.99%).
- 2) Generally, across all specialties and all programs, the Milestones data show attainment of Milestones across years in program (See Tables 4-143).
- 3) Each specialty shows variation in attainment of the Milestones, which needs to be investigated further (See Tables 4-143).

Further insights gained from numerous presentations, focus groups, and interactions with key stakeholders across the country include:

General Recommendations

- It is best not to use the Milestones themselves as assessment tools for residents/fellows on rotations or short clinical experiences.
- It is generally better to have a comprehensive “system” (program) of assessment rather than an *ad hoc* collection of disparate assessment tools.
- It appears to be most effective if residents/fellows are engaged in the collection of their performance data so they can more readily respond to areas for improvement.
- The process needs to be reasonable and easy to do.
- There needs to be further development in demonstrating exactly how to achieve certain milestones.
- There is a desire for improved assessment tools for skills related to Interpersonal and Communication Skills and Professionalism.

Early Benefits Reported

- There were many reports of more structure now in the program, highlighting a more comprehensive approach to monitoring residents’/fellows’ progression throughout their training.
- Many programs reported that it is now much easier to identify residents who are struggling early in training, and to refocus efforts and resources to help them achieve the goals of the program.
- Many residents/fellows reported receiving more comprehensive and structured feedback.
- Milestones more easily highlight specific gaps in training.
- Both residents/fellows and faculty members are more comfortable now with the narrative aspect of the Milestones vs. the “numbers.”

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Early Challenges Reported

- The process can make extra work for some programs.
- The Milestones as written often do not reflect the underlying construct.
- In some cases, residents/fellows fall between the levels specified on the ACGME Milestones Evaluation Form.
- In some cases, there are too many subcompetencies, which don't seem to add much to the assessment process.

Straight-Lining Ratings

Straight-lining (SL) ratings are defined as a string of identical Milestones ratings for a resident across all sub competencies. In the original vision of the NAS, it was assumed that Milestones ratings would vary by subcompetency with a resident if performance in each subcompetency was carefully examined independently.

However, it has been found that there are instances in which the rate of SL is higher than what might be expected, and these rates are presented in Table 3.

The rate of SL per specialty is calculated as follows: If any resident's string of Milestones ratings are identical across all subcompetencies, the resident is assigned a value of "1;" otherwise, "0."

In Table 3, the percent of residents who were assessed by the SL pattern is reported by year in residency. The third column includes the total number of subcompetency per specialty (e.g., there are 10 subcompetencies for the Allergy and Immunology Milestones assessment). Columns 4-10 show the percentage of residents whose Milestones ratings is made based on the SL rating patterns. For example, there are 147 first-year residents in June 2017 Milestones data for the allergy and immunology specialty. Of these residents, 15 residents' assessments show the SL rating patterns. Therefore, 10.2% (15/147) of the first-year residents in that specialty were given identical Milestones ratings across all 10 subcompetencies for that specialty.

Interpretation: Certainly, it may be appropriate for an individual resident to be assigned identical Milestones ratings across all subcompetencies (e.g., SL for Milestones Level 4 can be a valid rating pattern for the senior-most residents at time of graduation who have truly achieved Level 4 in all subcompetencies). What should be determined is whether this SL effect represents true lack of variation in competence, or if CCCs are simply providing similar ratings across competencies for other reasons, such as a belief that the description of individual milestones for some subcompetencies does not fit with their local setting, or they are otherwise having difficulty obtaining valid and defensible ratings through lack of resources or attention to educational assessment within their programs. These issues will be the subject of ongoing qualitative studies with collaborators from various specialties.

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Future Directions

In conclusion, the Milestones data are currently very complex and caution must be exercised in how these results are interpreted and communicated to various stakeholders. The validity of the data is only beginning to emerge, and there are potentially serious implications for misinterpretation. A validity framework (currently under development) can guide the process of CQI and help to realize the vision of the NAS as articulated by Nasca et al. in 2012.¹

In response to the information received to date, a system-wide project has been implemented to ultimately revise the Milestones language to make it easier for program directors to understand and implement locally, as well as to examine areas in which the Milestones language can be harmonized across specialties, especially in Competencies such as Professionalism and Interpersonal and Communication Skills. This project has come to be known as “Milestones 2.0,” and will take several years to complete, as feedback from the various stakeholders is collected.

In addition to work on Milestones 2.0, an obvious next step is to continue the interpretive work and research suggested above. This includes work on predictive validity of the Milestones, for example by correlating Patient Care Milestones ratings with independent measures of clinical performance or patient outcomes, as well as many other projects. To this end, several projects have been initiated by the Milestones team at the ACGME, as well as collaboratively with academic colleagues, to help address the following specific areas:

- 1) ongoing work to revise the Milestones language within each specialty, but also to consider harmonizing the language for Professionalism, Interpersonal and Communication Skills, Systems-based Practice, and Practice-based Learning and Improvement across specialties;
- 2) ongoing research on predictive validity of Milestones ratings vs. board scores in various specialties and other clinically-relevant performance data; and,
- 3) ongoing research on CCC processes to examine best practices for ensuring these committees take the necessary steps to maximize the validity of the Milestones ratings they report to the ACGME.

This work is ongoing and will continue to appear in the peer-reviewed literature to help build a stronger evidence base for the ability of this accreditation model to meet the larger vision outlined in the Introduction above. Finally, every member of the GME community should engage in research and debate regarding the potential for Milestones data to effect meaningful change in GME.

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Limitations

While the interpretations and conclusions that could be drawn from the data presented in this report are based on a single point in time (i.e., June 2017), trends for stability in the data patterns for academic year-end since June 2014 have recently been examined for the Phase 1 reporting specialties. Most of the Milestones data show signs of stability across this period, which lends greater confidence to the potential interpretations and conclusions that can be drawn from them, and will allow for greater confidence in communication of these interpretations back to the community to complete the CQI loop.

Acknowledgments

The authors wish to thank the program directors who attended the feedback sessions at the ACGME Annual Educational Conference for their valuable insights, as well as the various stakeholder groups to whom preliminary versions of these results have been presented over the past year.

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Additional Resources

See Appendix A for a list of recent publications involving the Milestones. In addition, the ACGME website contains the *Milestones Guidebook*, the *Milestones Guidebook for Residents and Fellows*, the Milestones FAQs, and the *Clinical Competency Committee Guidebook*, as well as a copy of a recent descriptive paper by the ACGME Milestones team entitled, “Reflections on the First 2 Years of Milestone Implementation.”

See <https://www.acgme.org/What-We-Do/Accreditation/Milestones/Overview>

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Table 1 – Number of Subcompetencies by Specialty

Specialty Name	Number of Sub-Competencies						
	Total	PC	MK	SBP	PBLI	PROF	ICS
Allergy and Immunology	10	4	1	1	2	1	1
Anesthesiology	25	10	1	2	4	5	3
- Adult cardiothoracic anesthesiology	15	2	4	3	2	3	1
- Critical care medicine	16	5	2	3	2	3	1
- Obstetric anesthesiology	15	4	2	3	2	3	1
- Pain medicine (multidisciplinary)	24	6	3	4	4	4	3
- Pediatric anesthesiology	14	3	2	3	2	3	1
Colon and Rectal Surgery	21	8	9	1	1	1	1
Dermatology	28	7	5	4	4	3	5
- Dermatopathology (multidisciplinary)	12	2	2	2	2	2	2
- Micrographic surgery and dermatologic oncology	14	4	2	2	2	2	2
Emergency Medicine	23	14	1	3	1	2	2
- Emergency medical services	14	5	1	2	2	2	2
- Medical toxicology	14	3	3	2	2	2	2
- Pediatric emergency medicine	23	11	1	2	1	5	3
- Sports medicine	14	3	3	2	2	2	2
- Undersea and hyperbaric medicine	17	4	6	2	1	2	2
Family Medicine	22	5	2	4	3	4	4
- Geriatric medicine	23	5	3	4	4	4	3
- Hospice and palliative medicine (multidisciplinary)	23	5	3	4	4	4	3
- Sports medicine	14	3	3	2	2	2	2
Internal Medicine	22	5	2	4	4	4	3
- Adult congenital heart disease	24	6	3	4	4	4	3
- Advanced heart failure and transplant cardiology	24	6	3	4	4	4	3
- Cardiovascular disease	24	6	3	4	4	4	3
- Clinical cardiac electrophysiology	24	6	3	4	4	4	3
- Critical care medicine	24	6	3	4	4	4	3
- Endocrinology, diabetes, and metabolism	24	6	3	4	4	4	3
- Gastroenterology	24	6	3	4	4	4	3
- Geriatric medicine	23	5	3	4	4	4	3
- Hematology	24	6	3	4	4	4	3
- Hematology and medical oncology	24	6	3	4	4	4	3
- Infectious disease	22	4	3	4	4	4	3
- Interventional cardiology	24	6	3	4	4	4	3
- Nephrology	24	6	3	4	4	4	3
- Medical oncology	24	6	3	4	4	4	3
- Pulmonary disease	24	6	3	4	4	4	3
- Pulmonary disease and critical care medicine	24	6	3	4	4	4	3

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Specialty Name	Number of Sub-Competencies						
	Total	PC	MK	SBP	PBLI	PROF	ICS
- Rheumatology	24	6	3	4	4	4	3
- Sleep medicine (multidisciplinary)	23	5	3	4	4	4	3
- Transplant hepatology	24	6	3	4	4	4	3
Medical Genetics and Genomics	20	9	2	2	2	3	2
- Medical biochemical genetics	16	3	3	3	2	3	2
- Molecular genetic pathology (multidisciplinary)	14	3	3	2	2	2	2
Neurological Surgery	24	8	8	2	2	2	2
Neurology	29	18	3	2	2	2	2
- Clinical neurophysiology	21	7	6	2	2	2	2
- Epilepsy	18	6	3	3	2	2	2
- Neuromuscular medicine	21	9	4	2	2	2	2
- Vascular neurology	20	4	7	3	2	2	2
Child neurology	27	15	4	2	2	2	2
Nuclear Medicine	19	5	7	2	2	1	2
Obstetrics and Gynecology	28	11	7	2	2	3	3
- Female pelvic medicine and reconstructive surgery	23	7	8	3	2	1	2
- Gynecologic oncology	20	5	7	2	2	2	2
- Maternal-fetal medicine	18	4	5	2	3	2	2
- Reproductive endocrinology and infertility	15	3	3	2	3	2	2
Ophthalmology	24	8	2	3	3	4	4
Orthopaedic Surgery	41	16	16	3	2	2	2
- Adult reconstructive orthopaedic surgery	23	7	7	3	2	2	2
- Foot and ankle orthopaedic surgery	24	8	8	3	1	2	2
- Hand surgery	18	7	7	1	1	1	1
- Musculoskeletal oncology	19	5	5	3	2	2	2
- Orthopaedic sports medicine	14	3	3	2	2	2	2
- Orthopaedic surgery of the spine	15	4	4	1	2	2	2
- Orthopaedic trauma	18	5	5	2	2	2	2
- Pediatric orthopaedic surgery	21	6	6	3	2	2	2
Osteopathic neuromusculoskeletal medicine	15	4	2	2	2	3	2
Otolaryngology	17	8	4	2	1	1	1
- Neurotology	13	3	2	2	2	2	2
- Pediatric otolaryngology	13	3	2	2	2	2	2
Pathology-anatomic and clinical	27	7	3	7	2	6	2
- Blood banking/transfusion medicine	16	3	2	3	3	3	2
- Cytopathology	18	2	2	5	2	4	3
- Forensic pathology	18	2	3	4	2	5	2
- Hematopathology	19	3	4	4	3	3	2
- Medical microbiology	15	2	3	3	2	3	2
- Neuropathology	19	6	2	3	3	3	2
- Pediatric pathology	17	4	3	3	2	3	2

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Specialty Name	Number of Sub-Competencies						
	Total	PC	MK	SBP	PBLI	PROF	ICS
- Selective pathology	21	3	4	3	6	3	2
Pediatrics	21	5	1	3	4	6	2
- Adolescent medicine	21	4	1	5	4	4	3
- Child abuse pediatrics	21	4	1	5	4	4	3
- Developmental-behavioral pediatrics	21	4	1	5	4	4	3
- Neonatal-perinatal medicine	21	4	1	5	4	4	3
- Pediatric cardiology	21	4	1	5	4	4	3
- Pediatric critical care medicine	21	4	1	5	4	4	3
- Pediatric emergency medicine	23	11	1	2	1	5	3
- Pediatric endocrinology	21	4	1	5	4	4	3
- Pediatric gastroenterology	21	4	1	5	4	4	3
- Pediatric hematology/oncology	21	4	1	5	4	4	3
- Pediatric infectious diseases	21	4	1	5	4	4	3
- Pediatric nephrology	21	4	1	5	4	4	3
- Pediatric pulmonology	21	4	1	5	4	4	3
- Pediatric rheumatology	21	4	1	5	4	4	3
- Pediatric sports medicine	14	3	3	2	2	2	2
- Pediatric transplant hepatology	21	4	1	5	4	4	3
Physical medicine and rehabilitation	19	7	1	3	3	3	2
- Brain injury medicine	16	5	2	3	2	2	2
- Spinal cord injury medicine	15	4	2	2	3	2	2
- Pediatric rehabilitation	16	5	2	2	3	2	2
- Sports medicine	14	3	3	2	2	2	2
Plastic Surgery	36	14	14	3	2	2	1
Plastic Surgery-Integrated	36	14	14	3	2	2	1
- Craniofacial surgery	10	2	4	1	1	1	1
- Hand surgery	18	7	7	1	1	1	1
Preventive Medicine-Aerospace Medicine	27	15	4	3	1	2	2
Preventive Medicine-Occupational Medicine	26	14	4	3	1	2	2
Preventive Medicine-Public Health and General Preventive Medicine	23	12	3	3	1	2	2
- Medical toxicology	14	3	3	2	2	2	2
Psychiatry	22	5	6	4	3	2	2
- Addiction psychiatry	16	3	3	4	2	2	2
- Child and adolescent psychiatry	21	5	6	4	2	2	2
- Forensic psychiatry	13	2	2	3	2	2	2
- Geriatric psychiatry	16	3	3	4	2	2	2
- Psychosomatic medicine	15	2	3	4	2	2	2
Radiation Oncology	22	11	2	3	2	2	2
Radiology-Diagnostic	12	2	2	2	3	1	2
- Abdominal radiology	13	3	2	2	2	2	2
- Endovascular surgical neuroradiology	18	5	5	3	1	2	2

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Specialty Name	Number of Sub-Competencies						
	Total	PC	MK	SBP	PBLI	PROF	ICS
- Musculoskeletal radiology	14	3	3	2	2	2	2
- Neuroradiology	14	3	3	1	3	2	2
- Nuclear radiology	15	3	3	3	2	2	2
- Pediatric radiology	14	3	3	2	2	1	3
- Vascular and interventional radiology	14	3	3	2	2	2	2
Surgery	16	3	2	2	3	3	3
- Complex general surgical oncology	23	10	1	2	4	4	2
- Hand surgery	18	7	7	1	1	1	1
- Pediatric surgery	22	9	2	3	2	4	2
- Surgical critical care	30	10	9	2	3	4	2
- Vascular surgery	31	8	12	3	3	3	2
Vascular Surgery-Integrated	31	8	12	3	3	3	2
Thoracic Surgery	26	8	10	3	2	2	1
- Congenital cardiac surgery	9	2	3	1	1	1	1
Thoracic surgery - integrated	26	8	10	3	2	2	1
Urology	34	8	4	4	7	6	5
- Female pelvic medicine and reconstructive surgery	23	7	8	3	2	1	2
- Pediatric urology	22	7	2	3	3	3	4
Transitional year	23	7	2	3	3	4	4
Internal medicine/pediatrics (Internal Medicine)	22	5	2	4	4	4	3
Internal medicine/pediatrics (Pediatrics)	21	5	1	3	4	6	2

Note:

PC - Patient Care	PBLI - Practice-based Learning and Improvement
MK - Medical Knowledge	PROF - Professionalism
SBP - Systems-based Practice	ICS - Interpersonal and Communication Skills

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Table 2 – Number of Residents by Year in Program

Number of Residents – June 2017								
Specialty Name	Total	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7
Allergy and Immunology	292	147	145					
Anesthesiology	5469	1161	1467	1438	1403			
- Adult cardiothoracic anesthesiology	200	200						
- Critical care medicine	187	187						
- Obstetric anesthesiology	41	41						
- Pain medicine (multidisciplinary)	363	363						
- Pediatric anesthesiology	225	225						
Colon and Rectal Surgery	95	95						
Dermatology	1379	467	471	441				
- Dermatopathology (multidisciplinary)	71	71						
- Micrographic surgery and dermatologic oncology	82	82						
Emergency Medicine	4682	1635	1524	1523				
- Emergency medical services	63	63						
- Medical toxicology	63	30	33					
- Pediatric emergency medicine	114	48	37	29				
- Sports medicine	14	14						
- Undersea and hyperbaric medicine	13	13						
Family Medicine	11301	3923	3790	3588				
- Geriatric medicine	49	49						
- Hospice and palliative medicine (multidisciplinary)	312	312						
- Sports medicine	219	219						
Internal Medicine	26621	10585	8236	7800				
- Adult congenital heart disease	15	9	6					
- Advanced heart failure and transplant cardiology	97	97						
- Cardiovascular disease	2759	969	917	873				
- Clinical cardiac electrophysiology	146	146						
- Critical care medicine	219	137	82					
- Endocrinology, diabetes, and metabolism	627	330	297					
- Gastroenterology	1578	541	534	503				
- Geriatric medicine	274	274						
- Hematology	15	10	5					
- Hematology and medical oncology	1726	596	570	560				
- Infectious disease	714	367	347					
- Interventional cardiology	318	318						
- Nephrology	859	454	405					
- Medical oncology	34	17	17					
- Pulmonary disease	74	40	34					
- Pulmonary disease and critical care medicine	1709	620	572	517				

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Specialty Name	Number of Residents – June 2017							
	Total	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7
- Rheumatology	460	248	212					
- Sleep medicine (multidisciplinary)	166	166						
- Transplant hepatology	41	41						
Medical Genetics and Genomics	65	32	33					
- Medical biochemical genetics	10	10						
- Molecular genetic pathology (multidisciplinary)	54	54						
Neurological Surgery	1448	236	235	225	212	199	193	148
Neurology	1649	434	438	418	359			
- Clinical neurophysiology	175	175						
- Epilepsy	80	80						
- Neuromuscular medicine	63	63						
- Vascular neurology	127	127						
Child neurology	362	125	123	114				
Nuclear Medicine	78	25	27	26				
Obstetrics and Gynecology	5498	1396	1374	1356	1372			
- Female pelvic medicine and reconstructive surgery	139	46	49	44				
- Gynecologic oncology	145	51	45	49				
- Maternal-fetal medicine	200	71	67	62				
- Reproductive endocrinology and infertility	77	28	27	22				
Ophthalmology	1474	488	497	489				
Orthopaedic Surgery	4242	869	863	845	845	820		
- Adult reconstructive orthopaedic surgery	41	41						
- Foot and ankle orthopaedic surgery	15	15						
- Hand surgery	147	147						
- Musculoskeletal oncology	17	17						
- Orthopaedic sports medicine	219	219						
- Orthopaedic surgery of the spine	32	32						
- Orthopaedic trauma	14	14						
- Pediatric orthopaedic surgery	39	39						
Osteopathic neuromusculoskeletal medicine	15	10	5					
Otolaryngology	1638	335	336	331	322	314		
- Neurotology	28	13	15					
- Pediatric otolaryngology	33	33						
Pathology-anatomic and clinical	2340	617	615	584	524			
- Blood banking/transfusion medicine	53	53						
- Cytopathology	141	141						
- Forensic pathology	47	47						
- Hematopathology	132	132						
- Medical microbiology	13	13						
- Neuropathology	56	32	24					
- Pediatric pathology	23	23						

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Specialty Name	Number of Residents – June 2017							
	Total	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7
- Selective pathology	158	158						
Pediatrics	9087	3146	3047	2894				
- Adolescent medicine	89	34	29	26				
- Child abuse pediatrics	38	9	17	12				
- Developmental-behavioral pediatrics	94	34	36	24				
- Neonatal-perinatal medicine	765	263	258	244				
- Pediatric cardiology	432	155	140	137				
- Pediatric critical care medicine	505	180	168	157				
- Pediatric emergency medicine	386	147	120	119				
- Pediatric endocrinology	245	85	88	72				
- Pediatric gastroenterology	290	102	100	88				
- Pediatric hematology/oncology	490	171	167	152				
- Pediatric infectious diseases	168	64	43	61				
- Pediatric nephrology	105	38	31	36				
- Pediatric pulmonology	167	62	51	54				
- Pediatric rheumatology	82	30	23	29				
- Pediatric sports medicine	24	24						
- Pediatric transplant hepatology	9	9						
Physical medicine and rehabilitation	764	256	253	255				
- Brain injury medicine	9	9						
- Spinal cord injury medicine	17	17						
- Pediatric rehabilitation	26	15	11					
- Sports medicine	22	22						
Plastic Surgery	323	88	106	129				
Plastic Surgery-Integrated	748	151	149	139	121	107	81	
- Craniofacial surgery	9	9						
- Hand surgery	24	24						
Preventive Medicine-Aerospace Medicine	43	25	18					
Preventive Medicine-Occupational Medicine	122	58	64					
Preventive Medicine-Public Health and General Preventive Medicine	175	95	80					
- Medical toxicology	5	5						
Psychiatry	5660	1573	1558	1450	1079			
- Addiction psychiatry	80	80						
- Child and adolescent psychiatry	858	460	398					
- Forensic psychiatry	65	65						
- Geriatric psychiatry	59	59						
- Psychosomatic medicine	82	82						
Radiation Oncology	756	197	193	188	178			
Radiology-Diagnostic	4777	1226	1211	1189	1151			
- Abdominal radiology	46	46						
- Endovascular surgical neuroradiology	6	6						

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Specialty Name	Number of Residents – June 2017							Yr 7
	Total	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	
- Musculoskeletal radiology	33	33						
- Neuroradiology	261	261						
- Nuclear radiology	12	12						
- Pediatric radiology	67	67						
- Vascular and interventional radiology	284	284						
Surgery	8708	2833	1725	1460	1360	1330		
- Complex general surgical oncology	106	54	52					
- Hand surgery	8	8						
- Pediatric surgery	83	36	47					
- Surgical critical care	255	255						
- Vascular surgery	241	124	117					
Vascular Surgery-Integrated	260	58	60	58	42	42		
Thoracic Surgery	132	66	66					
- Congenital cardiac surgery	7	7						
Thoracic surgery - integrated	162	36	36	31	26	21	12	
Urology	1278	336	317	312	313			
- Female pelvic medicine and reconstructive surgery	31	7	15	9				
- Pediatric urology	25	25						
Transitional year	1125	1125						
Internal medicine/pediatrics	1484	393	368	362	361			

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Table 3 – Rate of Straight-lining (June 2017 data)

Specialty Name (total number of residents)	Number of Sub-Competencies	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7
Allergy and Immunology (292)	10	10.2	15.2					
Anesthesiology (5469)	25	35.7	21.0	21.2	24.6			
- Adult cardiothoracic anesthesiology (200)	15	27.0						
- Critical care medicine (187)	16	14.4						
- Obstetric anesthesiology (41)	15	22.0						
- Pain medicine (multidisciplinary) (363)	24	23.1						
- Pediatric anesthesiology (225)	14	10.7						
Colon and Rectal Surgery (95)	21	9.5						
Dermatology (1379)	28	8.4	12.3	14.3				
- Dermatopathology (multidisciplinary) (71)	12	26.8						
- Micrographic surgery and dermatologic oncology (82)	14	23.2						
Emergency Medicine (4682)	23	4.6	5.0	10.0				
- Emergency medical services (63)	14	6.3						
- Medical toxicology (63)	14	6.7	21.2					
- Pediatric emergency medicine (114)	23	12.5	5.4	13.8				
- Sports medicine (14)	14	0.0						
- Undersea and hyperbaric medicine (13)	17	0.0						
Family Medicine (11301)	22	3.7	3.4	5.5				
- Geriatric medicine (49)	23	2.0						
- Hospice and palliative medicine (multidisciplinary)	23	12.5						
- Sports medicine (219)	14	3.2						
Internal Medicine (26621)	22	9.3	10.4	24.4				
- Adult congenital heart disease (15)	24	11.1	16.7					
- Advanced heart failure and transplant cardiology (97)	24	16.5						
- Cardiovascular disease (2759)	24	17.5	14.9	28.4				
- Clinical cardiac electrophysiology (146)	24	20.5						
- Critical care medicine (219)	24	13.9	18.3					
- Endocrinology, diabetes, and metabolism (627)	24	7.6	15.5					
- Gastroenterology (1578)	24	8.1	11.4	26.0				
- Geriatric medicine (274)	23	8.4						
- Hematology (15)	24	0.0	20.0					
- Hematology and medical oncology (1726)	24	9.4	10.7	20.7				
- Infectious disease (714)	22	6.0	20.2					
- Interventional cardiology (318)	24	35.2						
- Nephrology (859)	24	7.0	20.5					
- Medical oncology (34)	24	11.8	41.2					
- Pulmonary disease (74)	24	7.5	23.5					
- Pulmonary disease and critical care medicine (1709)	24	12.7	14.5	25.3				

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Specialty Name (total number of residents)	Number of Sub-Competencies	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7
- Rheumatology (460)	24	8.1	14.6					
- Sleep medicine (multidisciplinary) (166)	23	25.3						
- Transplant hepatology (41)	24	24.4						
Medical Genetics and Genomics (65)	20	3.1	18.2					
- Medical biochemical genetics (10)	16	20.0						
- Molecular genetic pathology (multidisciplinary) (54)	14	5.6						
Neurological Surgery (1448)	24	5.9	5.1	3.6	2.8	4.0	6.2	7.4
Neurology (1649)	29	6.0	0.2	2.4	5.3			
- Clinical neurophysiology (175)	21	2.9						
- Epilepsy (80)	18	10.0						
- Neuromuscular medicine (63)	21	3.2						
- Vascular neurology (127)	20	16.5						
Child neurology (362)	27	1.6	1.6	7.0				
Nuclear Medicine (78)	19	28.0	3.7	11.5				
Obstetrics and Gynecology (5498)	28	2.3	2.0	2.1	8.6			
- Female pelvic med and reconstructive surgery (139)	23	0.0	0.0	2.3				
- Gynecologic oncology (145)	20	5.9	2.2	6.1				
- Maternal-fetal medicine (200)	18	1.4	3.0	6.5				
- Reproductive endocrinology and infertility (77)	15	0.0	0.0	0.0				
Ophthalmology (1474)	24	4.1	5.8	11.2				
Orthopaedic Surgery (4242)	41	6.4	6.8	6.7	8.4	14.3		
- Adult reconstructive orthopaedic surgery (41)	23	14.6						
- Foot and ankle orthopaedic surgery (15)	24	53.3						
- Hand surgery (147)	18	18.4						
- Musculoskeletal oncology (17)	19	41.2						
- Orthopaedic sports medicine (219)	14	40.6						
- Orthopaedic surgery of the spine (32)	15	28.1						
- Orthopaedic trauma (14)	18	57.1						
- Pediatric orthopaedic surgery (39)	21	12.8						
Osteopathic neuromusculoskeletal medicine (15)	15	0.0	0.0					
Otolaryngology (1638)	17	12.8	7.1	8.2	8.1	13.1		
- Neurotology (28)	13	23.1	13.3					
- Pediatric otolaryngology (33)	13	24.2						
Pathology-anatomic and clinical (2340)	27	5.2	4.6	5.8	8.4			
- Blood banking/transfusion medicine (53)	16	7.5						
- Cytopathology (141)	18	7.8						
- Forensic pathology (47)	18	0.0						
- Hematopathology (132)	19	8.3						
- Medical microbiology (13)	15	0.0						
- Neuropathology (56)	19	3.1	4.2					
- Pediatric pathology (23)	17	8.7						

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Specialty Name (total number of residents)	Number of Sub-Competencies	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7
- Selective pathology (158)	21	18.4						
Pediatrics (9087)	21	4.0	3.9	7.3				
- Adolescent medicine (89)	21	8.8	0.0	11.5				
- Child abuse pediatrics (38)	21	0.0	0.0	16.7				
- Developmental-behavioral pediatrics (94)	21	0.0	0.0	12.5				
- Neonatal-perinatal medicine (765)	21	2.3	3.9	8.2				
- Pediatric cardiology (432)	21	8.4	7.9	10.9				
- Pediatric critical care medicine (505)	21	0.6	2.4	4.5				
- Pediatric emergency medicine (386)	23	2.0	3.3	8.4				
- Pediatric endocrinology (245)	21	4.7	1.1	9.7				
- Pediatric gastroenterology (290)	21	5.9	11.0	15.9				
- Pediatric hematology/oncology (490)	21	3.5	5.4	6.6				
- Pediatric infectious diseases (168)	21	0.0	0.0	1.6				
- Pediatric nephrology (105)	21	15.8	3.2	5.6				
- Pediatric pulmonology (167)	21	6.5	7.8	7.4				
- Pediatric rheumatology (82)	21	0.0	8.7	3.4				
- Pediatric sports medicine (24)	14	25.0						
- Pediatric transplant hepatology (9)	21	0.0						
Physical medicine and rehabilitation (764)	19	5.1	7.5	20.0				
- Brain injury medicine (9)	16	0.0						
- Spinal cord injury medicine (17)	15	29.4						
- Pediatric rehabilitation (26)	16	6.7	9.1					
- Sports medicine (22)	14	22.7						
Plastic Surgery (323)	36	9.1	11.3	20.9				
Plastic Surgery-Integrated (748)	36	8.6	6.7	4.3	9.9	6.5	6.2	
- Craniofacial surgery (9)	10	22.2						
- Hand surgery (24)	18	25.0						
Preventive Medicine-Aerospace Medicine (43)	27	0.0	0.0					
Preventive Medicine-Occupational Medicine (122)	26	0.0	1.6					
Preventive Medicine-Public Health and General Preventive Medicine (175)	23	0.0	0.0					
- Medical toxicology (5)	14	0.0						
Psychiatry (5660)	22	6.7	5.3	5.9	8.4			
- Addiction psychiatry (80)	16	13.8						
- Child and adolescent psychiatry (858)	21	1.1	3.5					
- Forensic psychiatry (65)	13	4.6						
- Geriatric psychiatry (59)	16	8.5						
- Psychosomatic medicine (82)	15	12.2						
Radiation Oncology (756)	22	9.1	8.3	10.1	20.8			
Radiology-Diagnostic (4777)	12	24.2	17.8	16.7	31.9			
- Abdominal radiology (46)	13	0.0						

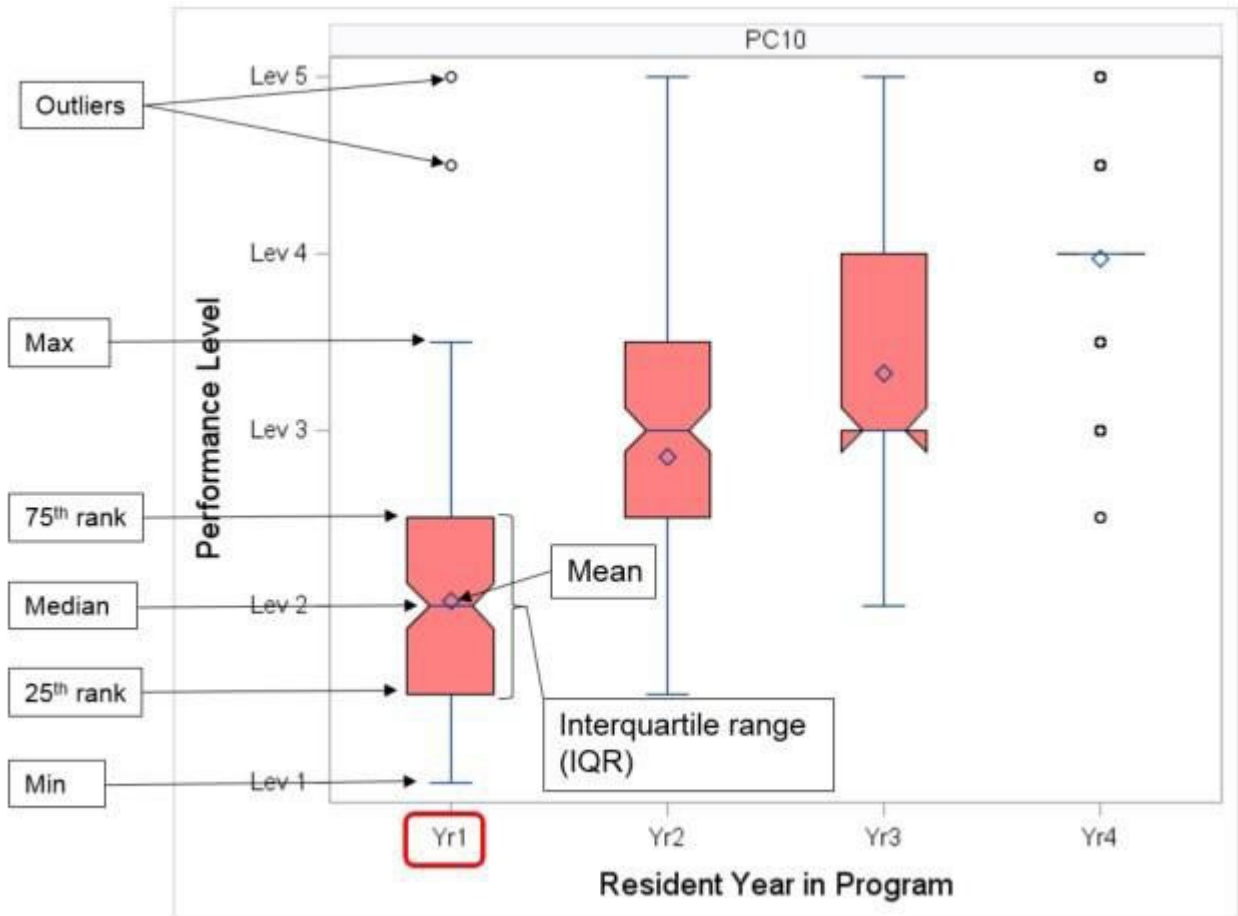
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Specialty Name (total number of residents)	Number of Sub-Competencies	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7
- Endovascular surgical neuroradiology (6)	18	16.7						
- Musculoskeletal radiology (33)	14	30.3						
- Neuroradiology (261)	14	20.7						
- Nuclear radiology (12)	15	16.7						
- Pediatric radiology (67)	14	26.9						
- Vascular and interventional radiology (284)	14	19.0						
Surgery (8708)	16	20.5	13.0	13.6	14.4	37.0		
- Complex general surgical oncology (106)	23	7.4	3.8					
- Hand surgery (8)	18	0.0						
- Pediatric surgery (83)	22	0.0	4.3					
- Surgical critical care (255)	30	12.9						
- Vascular surgery (241)	31	2.4	9.4					
Vascular Surgery-Integrated (260)	31	5.2	3.3	1.7	4.8	2.4		
Thoracic Surgery (132)	26	0.0	3.0					
- Congenital cardiac surgery (7)	9	14.3						
Thoracic Surgery-Integrated (162)	26	2.8	0.0	0.0	0.0	9.5	25.0	
Urology (1278)	34	10.4	9.1	11.9	22.0			
- Female pelvic medicine and reconstructive surgery	23	0.0	13.3	22.2				
- Pediatric urology (25)	22	8.0						
Transitional Year (1125)	23	11.9						

Figure 1: Key to Box Plots

Box plots provide a rigorous and robust way to display complex data such as Milestones. The components of the box plots used for the Milestones are shown below. In this example, the data represent attainment of Patient Care subcompetency #10.



As can be seen from this diagram, the **median** Milestone level for each year of resident is represented by the horizontal line, bounded by the **25th and 75th rank** of Milestone ratings, also known as the **inter-quartile range (IQR)**. The **mean** rating is represented by the diamond, but should be interpreted with caution given Milestones are ordinal, not interval data. **Min** represents the lowest level and **Max** the highest level (the “**whiskers**”), excluding **outliers** (represented by the open circles). Overall we can see a general upward trajectory in this subcompetency from Year 1 (median level 2) to Year 4 (median level 4).

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In this example, focus on Year 1 in the above box plot (highlighted by the red box). Remember that most Milestone sets possess five levels of development with transition zones between each Milestone level (designated as half increments such as level 2.5). Assume there are 2,000 Year 1 residents in this specialty. The median for Year 1 is Level 2. The interquartile range is level 1.5 (25th percentile rank) and level 2.5 (75th percentile rank).

With regards to Milestone levels, the levels can be sorted from least to greatest, and then graphed as shown in this box-and-whisker plot. Take the highest 50 percent of the group (1,000) who were at or above Milestone Level 2; they are represented by everything above the **median** line. Fifty percent of the Year 1 residents fall between Level 1.5 and Level 2.5 (IQR). Those in the top 25 percent of Milestone judgments in the Year 1 group (500) are shown by the top “whisker” (here labeled as **Max**) and the **outlier** open circles. The outliers represent those who were judged to be substantially higher (in this case we see two outlier circles) or were judged to be a lot lower than normal (in these example there are no low outliers). The number of people represented by the circles will vary by the sample size.

Box-and-whisker plots also provide information on more than just the four split groups. It is also possible to see which way the Milestone data can “sway.” For example, if more residents are judged much higher than just a few residents being judged much lower, the median is going to be higher or the top whisker could be longer than the bottom one. Box-and-whisker plots provide a better overview of the Milestone data’s distribution than simple means and standard deviations.

The Box-and-whisker plots must be interpreted in the context of the Milestone descriptions for each sub-competency within each discipline. Provided below are links to each specialty Milestone set to help guide review of the data.

Specialty:

Allergy and Immunology:

<http://www.acgme.org/Specialties/Milestones/pfcatid/5/Allergy%20and%20Immunology>

Anesthesiology: <http://www.acgme.org/Specialties/Milestones/pfcatid/6/Anesthesiology>

Colon and Rectal Surgery:

<http://www.acgme.org/Specialties/Milestones/pfcatid/4/Colon%20and%20Rectal%20Surgery>

Dermatology: <http://www.acgme.org/Specialties/Milestones/pfcatid/3/Dermatology>

Emergency Medicine:

<http://www.acgme.org/Specialties/Milestones/pfcatid/7/Emergency%20Medicine>

Family Medicine: <http://www.acgme.org/Specialties/Milestones/pfcatid/8/Family%20Medicine>

Internal Medicine: <http://www.acgme.org/Specialties/Milestones/pfcatid/2/Internal%20Medicine>

Medical Genetics and Genomics:

<http://www.acgme.org/Specialties/Milestones/pfcatid/9/Medical%20Genetics%20and%20Genomics>

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Neurological Surgery:

<http://www.acgme.org/Specialties/Milestones/pfcatid/10/Neurological%20Surgery>

Neurology: <http://www.acgme.org/Specialties/Milestones/pfcatid/37/Neurology>

Nuclear Medicine:

<http://www.acgme.org/Specialties/Milestones/pfcatid/11/Nuclear%20Medicine>

Obstetrics and Gynecology:

<http://www.acgme.org/Specialties/Milestones/pfcatid/12/Obstetrics%20and%20Gynecology>

Ophthalmology: <http://www.acgme.org/Specialties/Milestones/pfcatid/13/Ophthalmology>

Orthopaedic Surgery:

<http://www.acgme.org/Specialties/Milestones/pfcatid/14/Orthopaedic%20Surgery>

Otolaryngology: <http://www.acgme.org/Specialties/Milestones/pfcatid/15/Otolaryngology>

Pathology: <http://www.acgme.org/Specialties/Milestones/pfcatid/18/Pathology>

Pediatrics: <http://www.acgme.org/Specialties/Milestones/pfcatid/16/Pediatrics>

Physical Medicine and Rehabilitation:

<http://www.acgme.org/Specialties/Milestones/pfcatid/17/Physical%20Medicine%20and%20Rehabilitation>

Plastic Surgery: <http://www.acgme.org/Specialties/Milestones/pfcatid/19/Plastic%20Surgery>

Preventive Medicine:

<http://www.acgme.org/Specialties/Milestones/pfcatid/20/Preventive%20Medicine>

Psychiatry: <http://www.acgme.org/Specialties/Milestones/pfcatid/21/Psychiatry>

Radiation Oncology:

<http://www.acgme.org/Specialties/Milestones/pfcatid/22/Radiation%20Oncology>

Radiology-Diagnostic: <http://www.acgme.org/Specialties/Milestones/pfcatid/23/Radiology>

Surgery: <http://www.acgme.org/Specialties/Milestones/pfcatid/24/Surgery>

Thoracic Surgery:

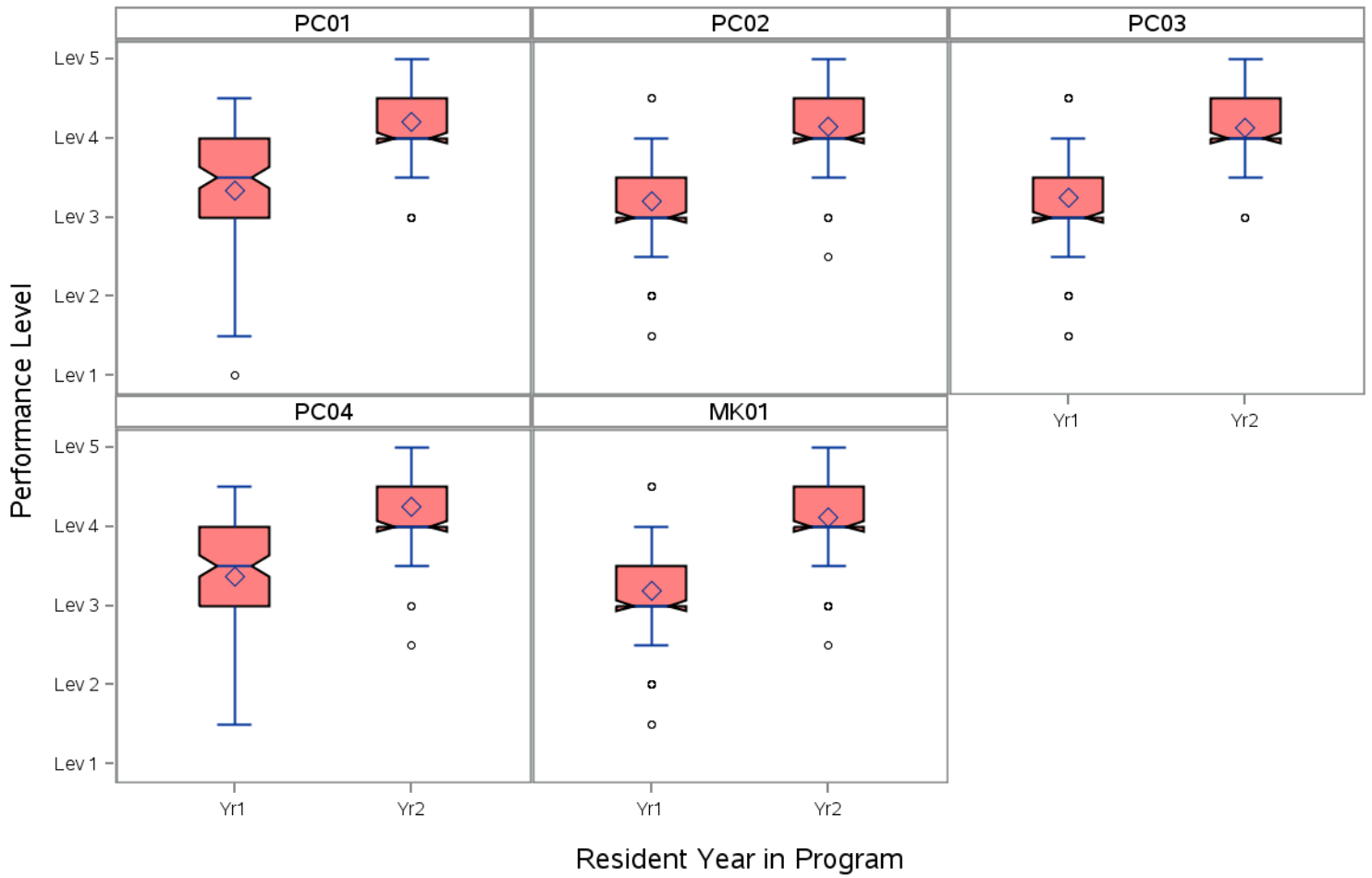
<http://www.acgme.org/Specialties/Milestones/pfcatid/25/Thoracic%20Surgery>

Transitional Year:

<http://www.acgme.org/Specialties/Milestones/pfcatid/36/Transitional%20Year>

Urology: <http://www.acgme.org/Specialties/Milestones/pfcatid/26/Urology>

Table 4 - Allergy and immunology (June 2017)



Continue to next page for Allergy and immunology

Table 4 - Allergy and immunology (June 2017)

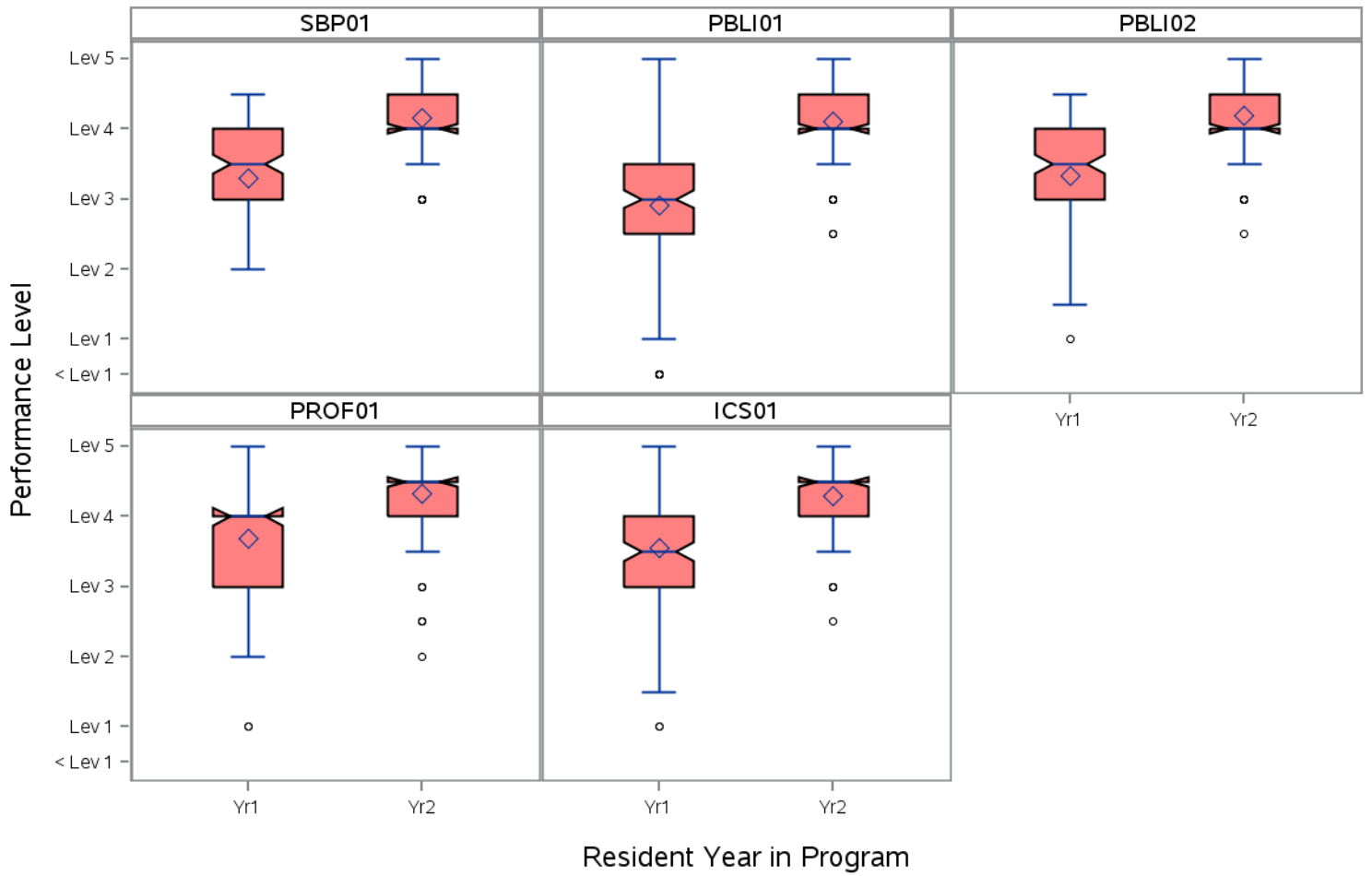
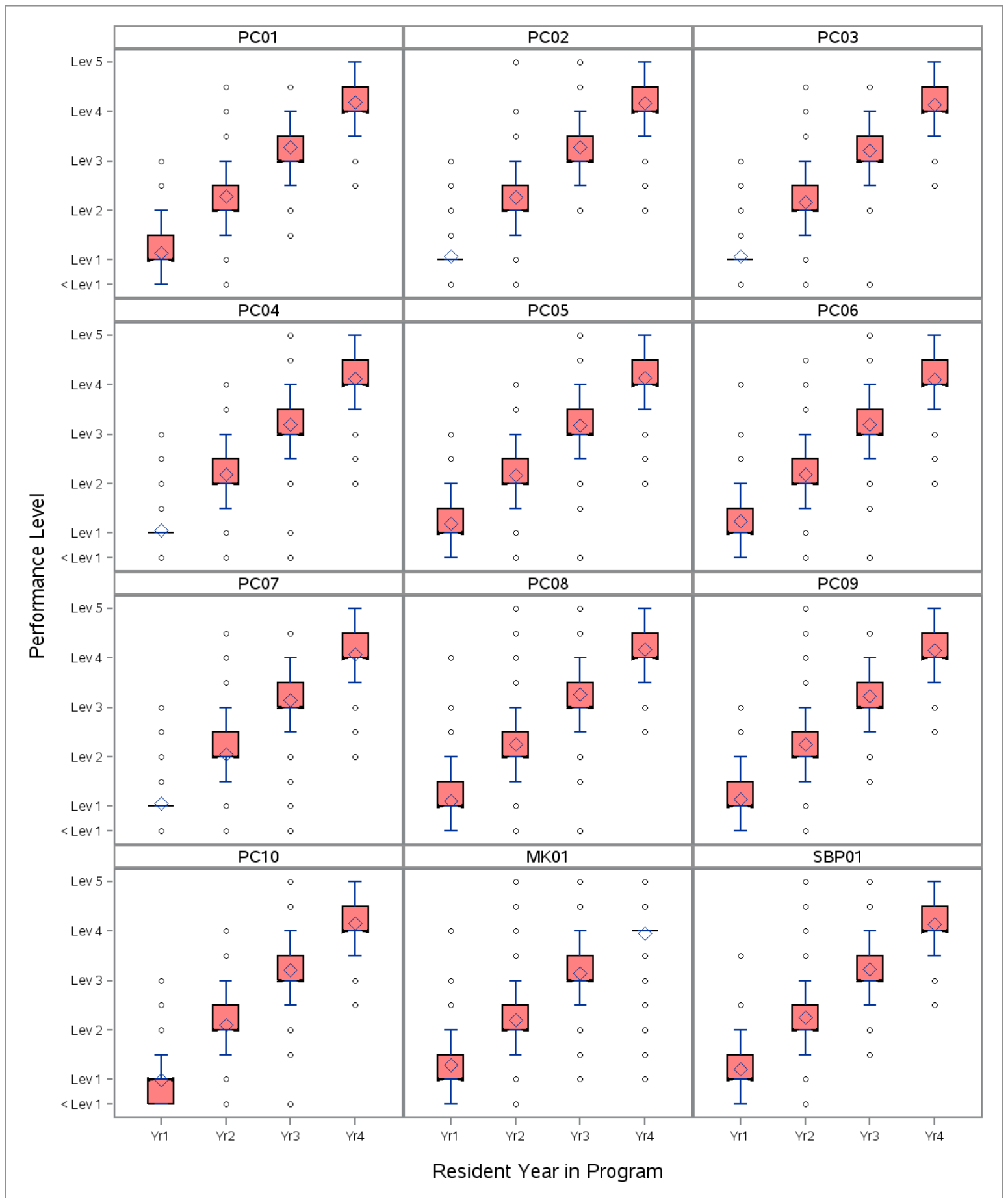
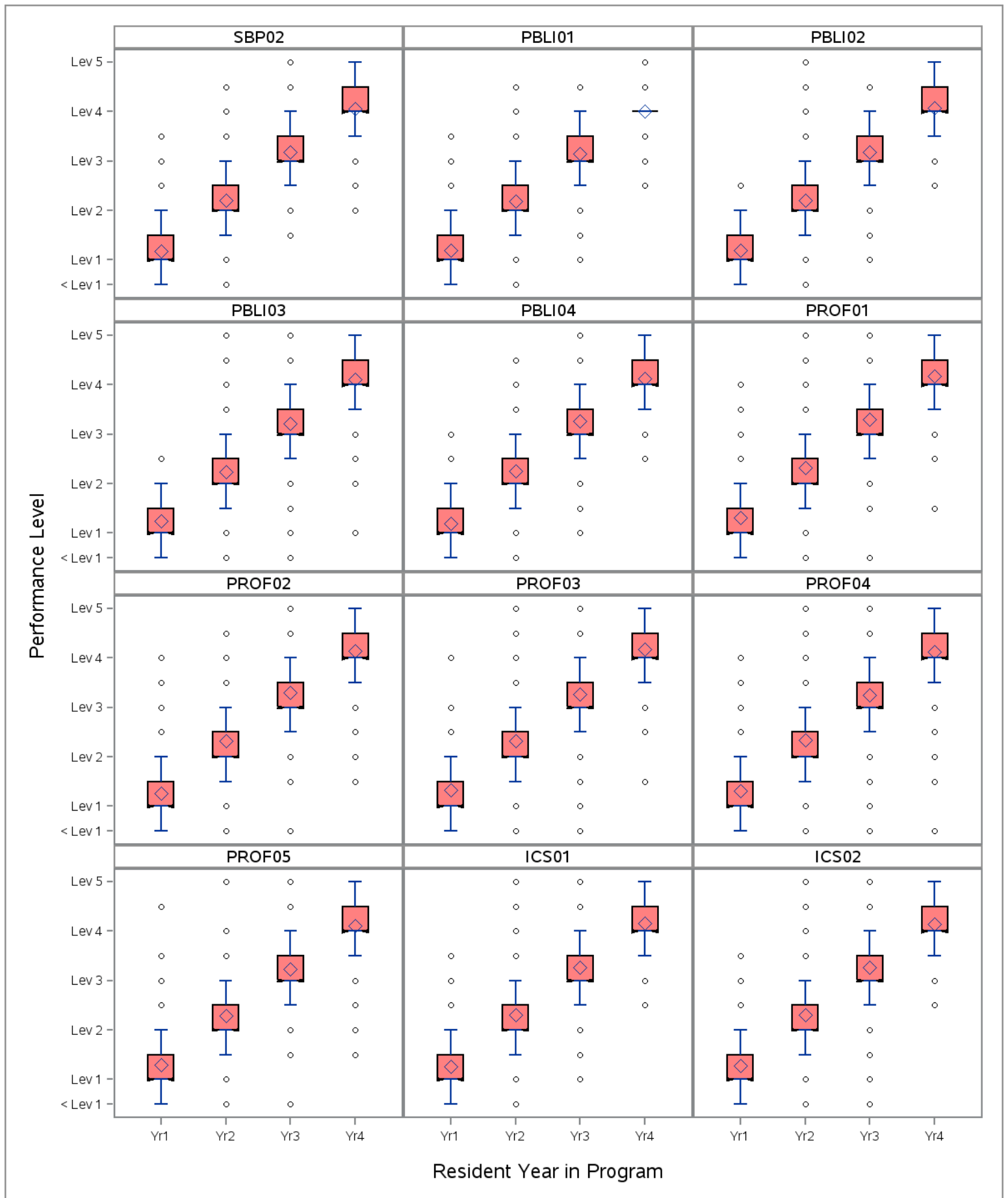


Table 5 - Anesthesiology (June 2017)



Continue to next page for Anesthesiology

Table 5 - Anesthesiology (June 2017)



Continue to next page for Anesthesiology

Table 5 - Anesthesiology (June 2017)

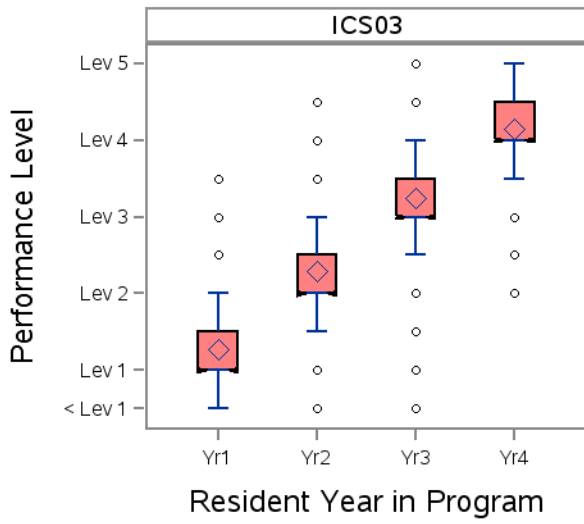
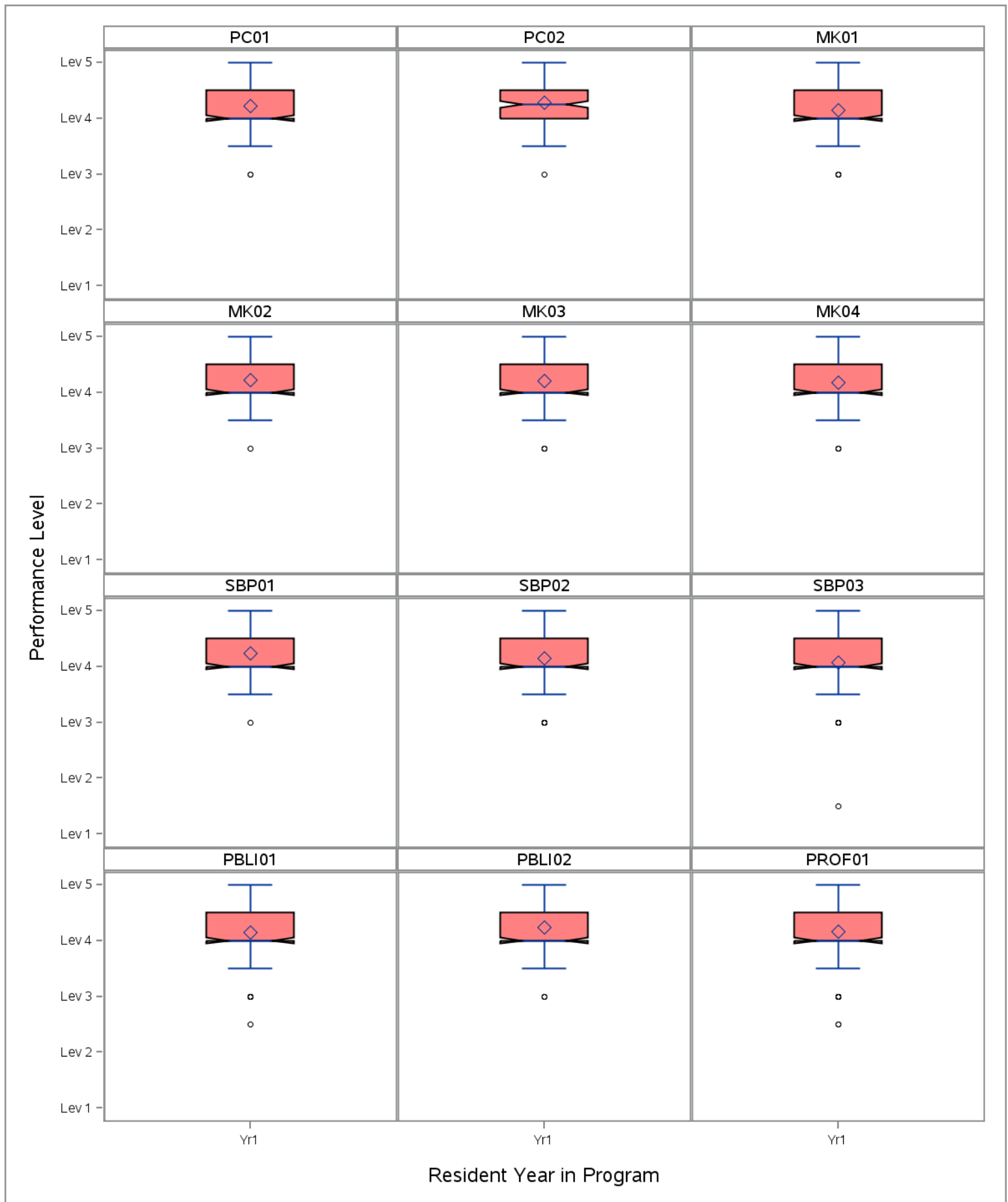


Table 6 - Adult cardiothoracic anesthesiology (June 2017)



Continue to next page for Adult cardiothoracic Anesthesiology

Table 6 - Adult cardiothoracic anesthesiology (June 2017)

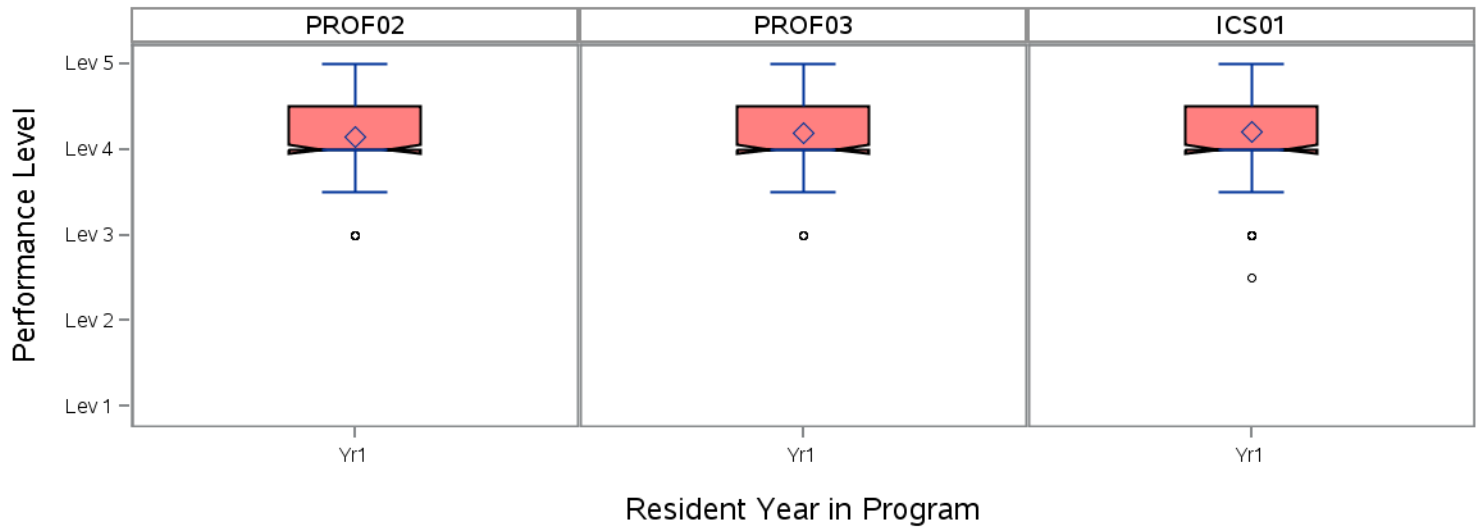
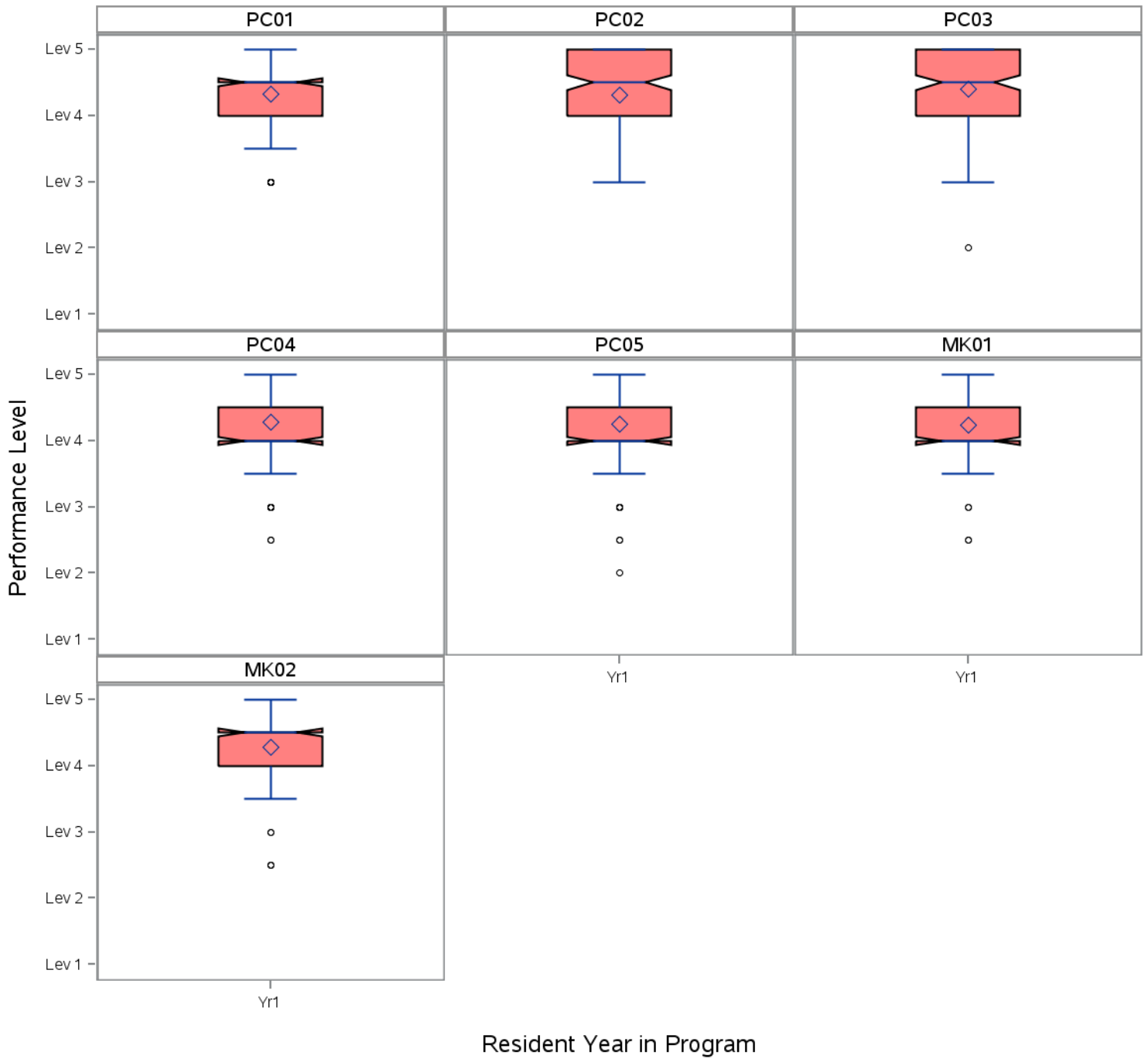


Table 7 - Critical care medicine (June 2017)



Continue to next page for Critical care medicine

Table 7 - Critical care medicine (June 2017)

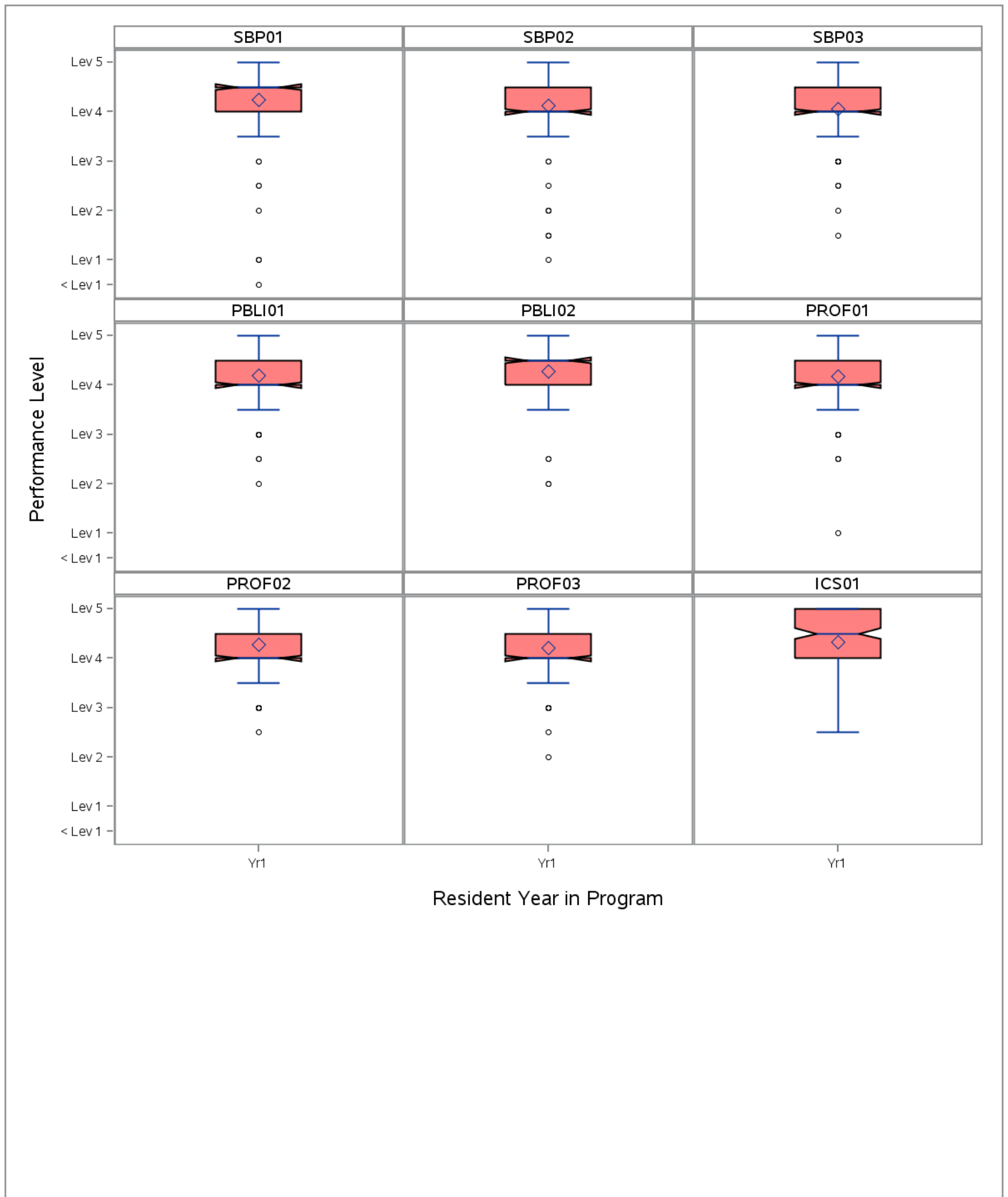
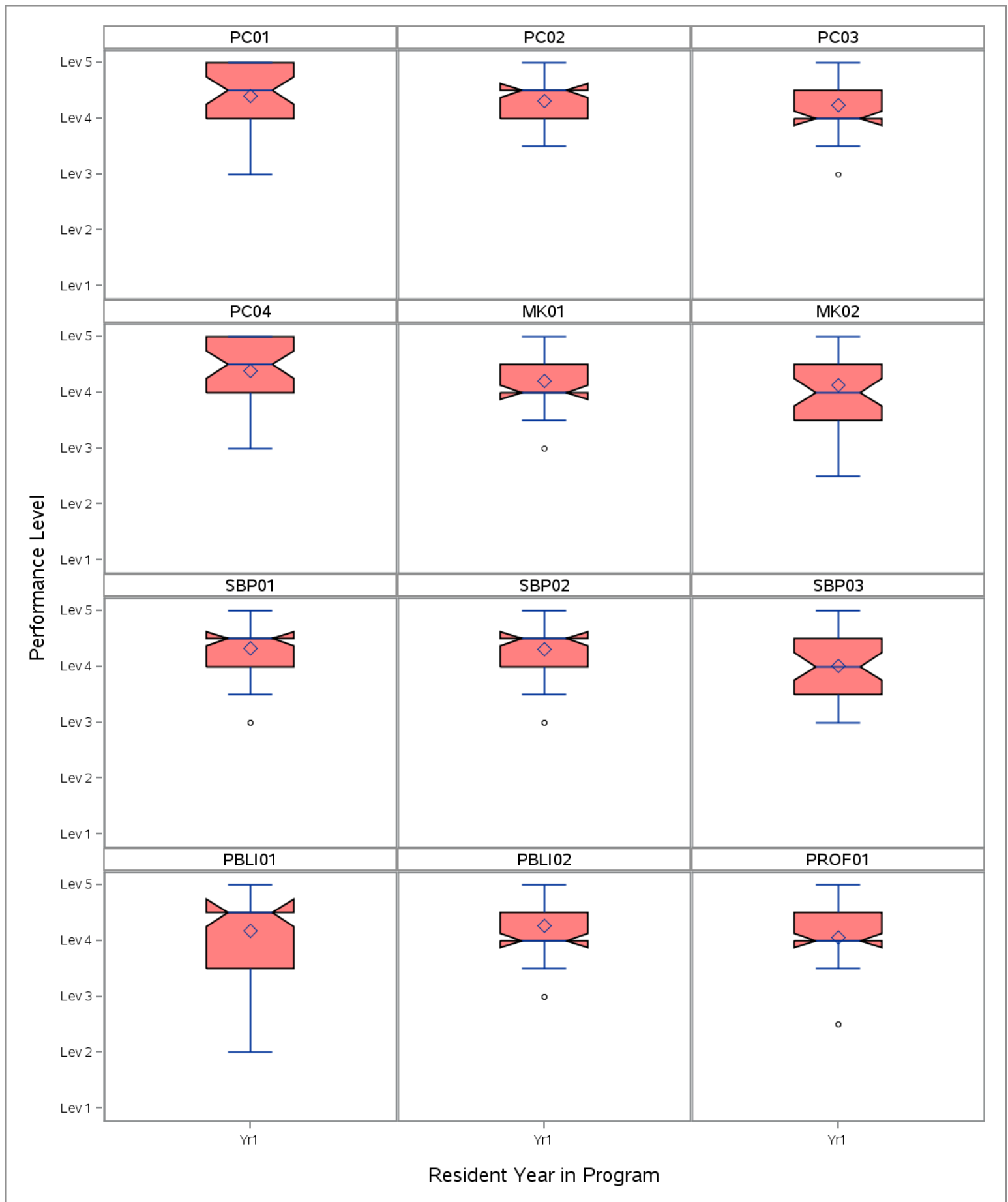


Table 8 - Obstetric anesthesiology (June 2017)



Continue to next page for Obstetric anesthesiology

Table 8 - Obstetric anesthesiology (June 2017)

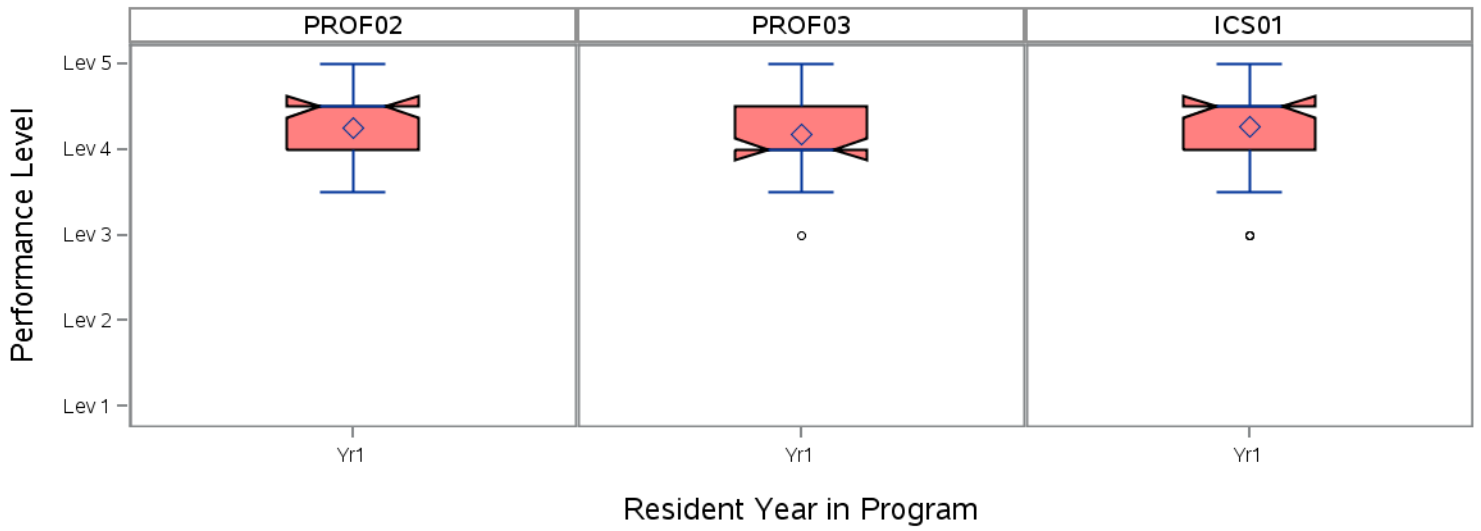
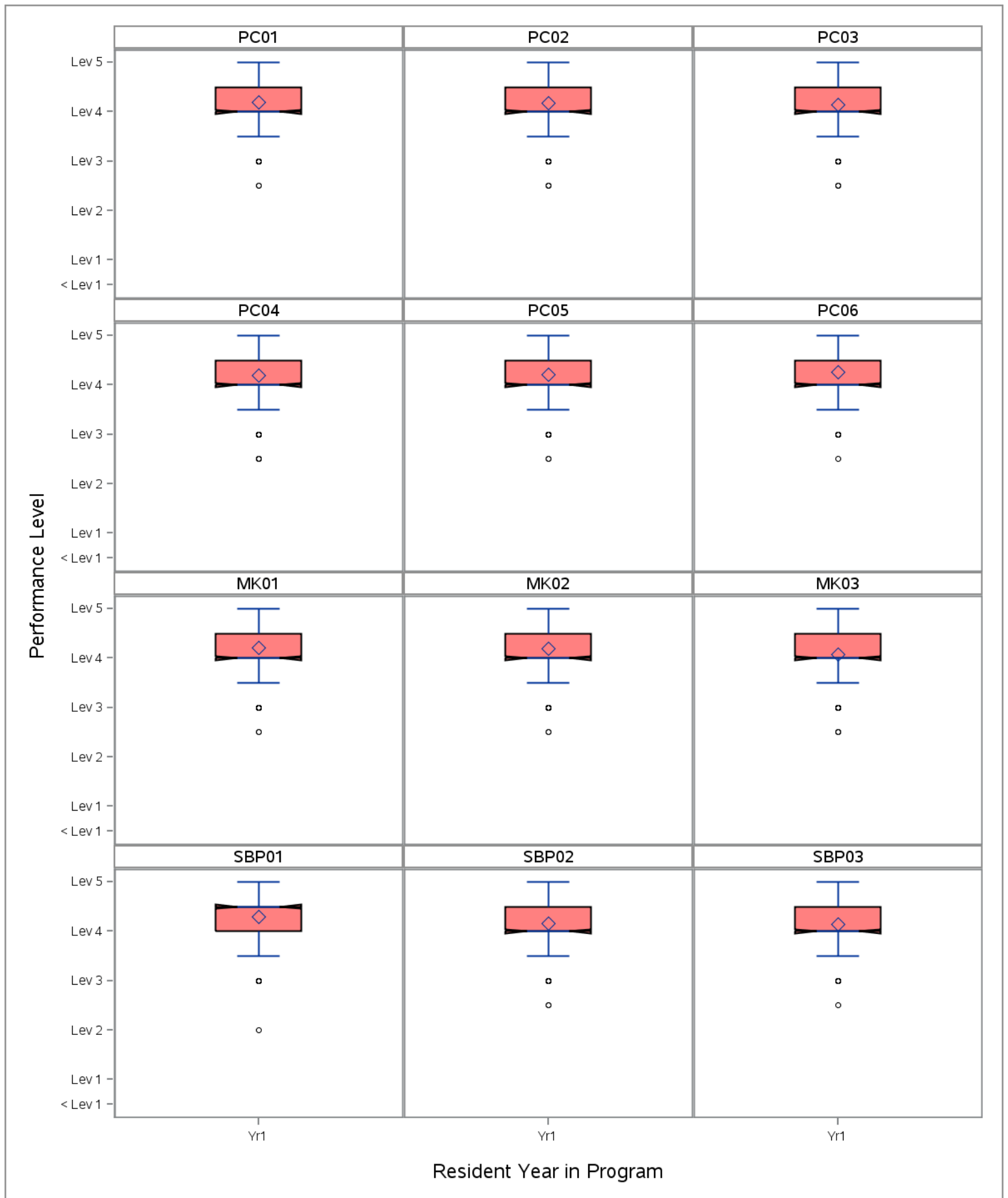


Table 9 - Pain medicine (multidisciplinary) (June 2017)



Continue to next page for Pain medicine (multidisciplinary)

Table 9 - Pain medicine (multidisciplinary) (June 2017)

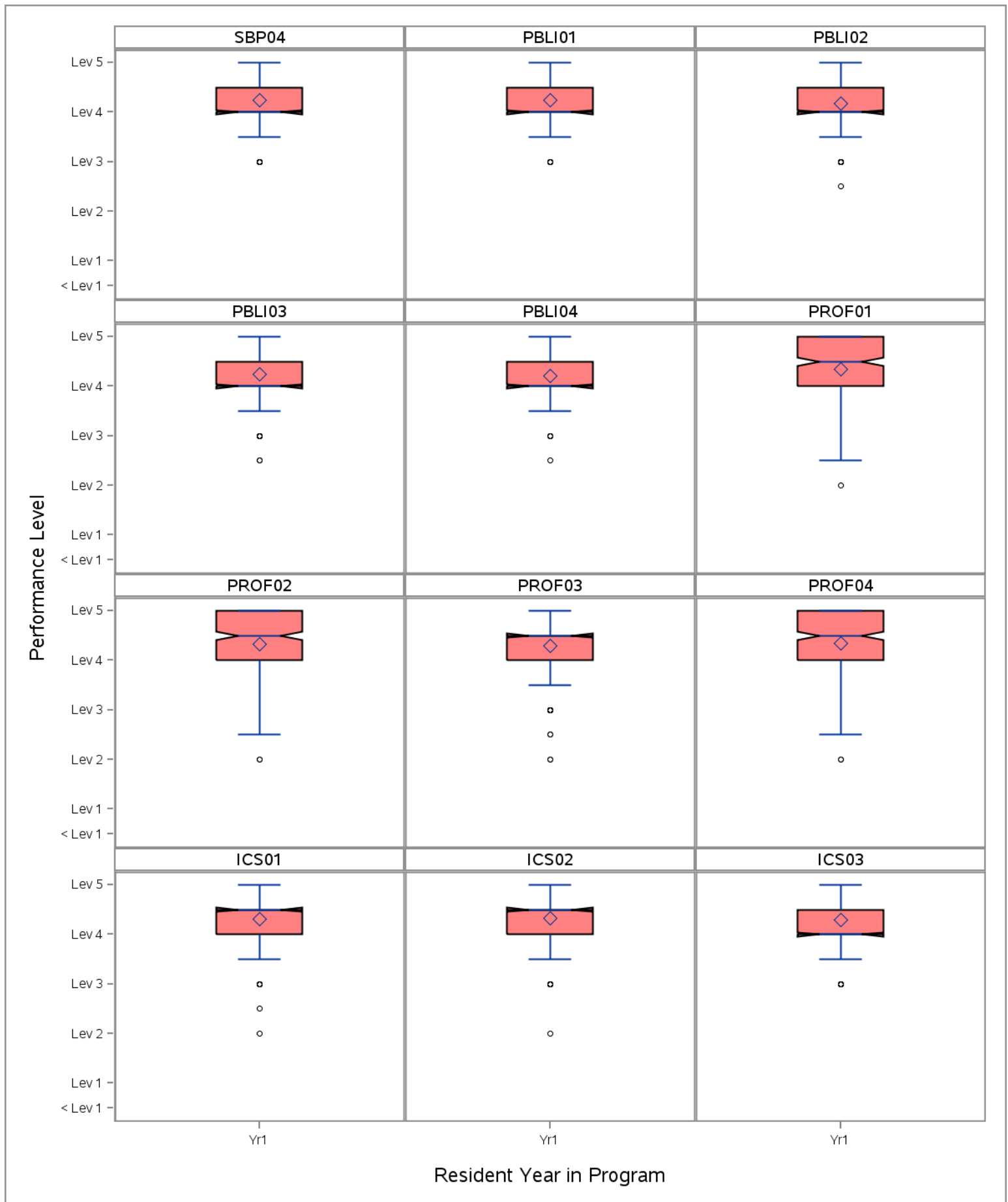
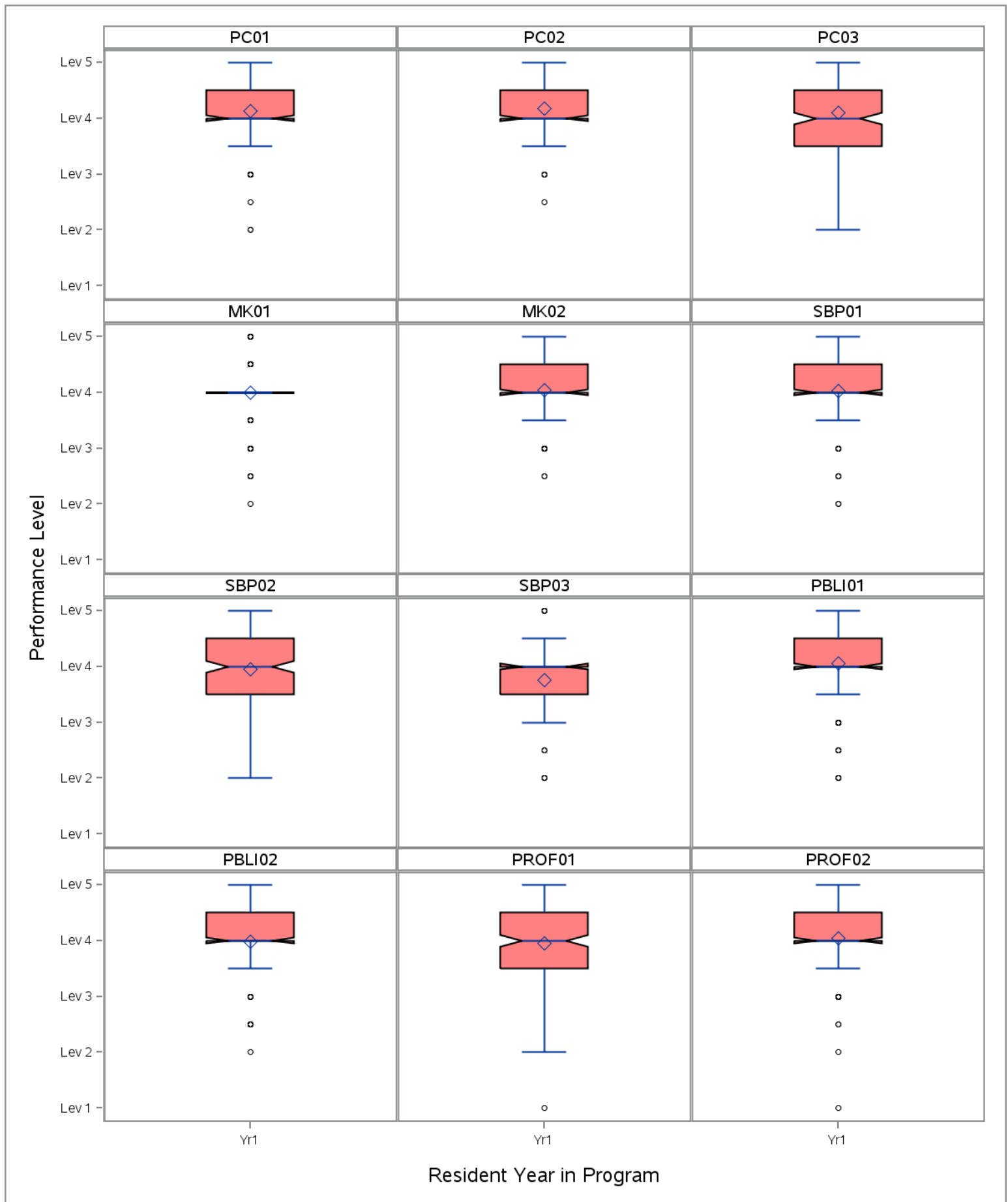


Table 10 - Pediatric anesthesiology (June 2017)



Continue to next page for Pediatric anesthesiology

Table 10 - Pediatric anesthesiology (June 2017)

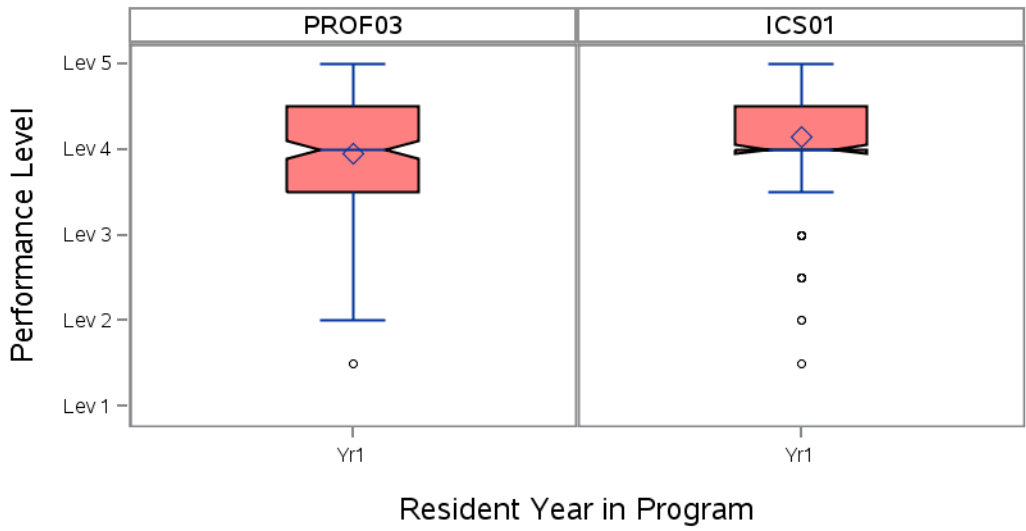
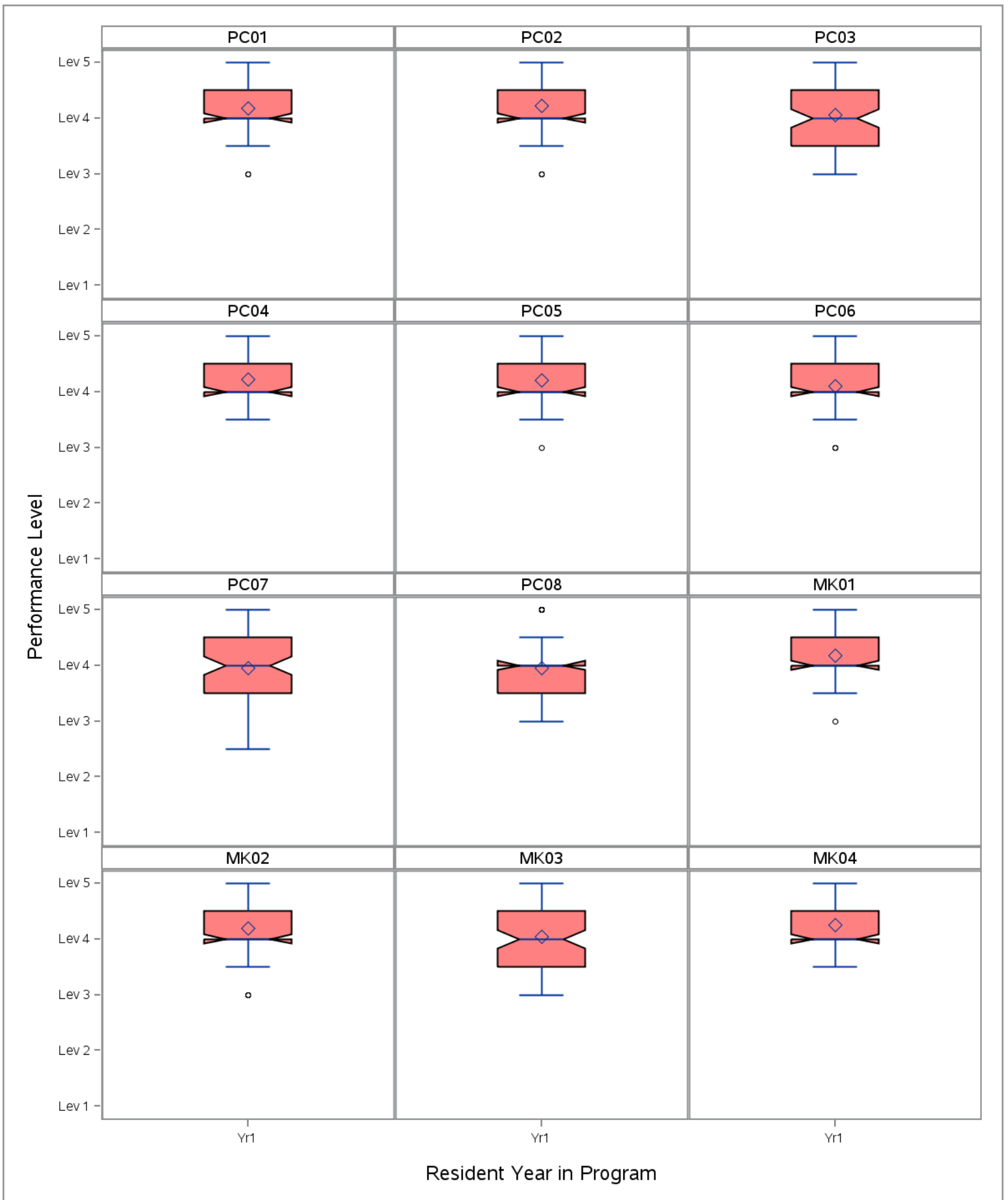


Table 11 - Colon and rectal surgery (June 2017)



Continue to next page for Colon and rectal surgery

Table 11 - Colon and rectal surgery (June 2017)

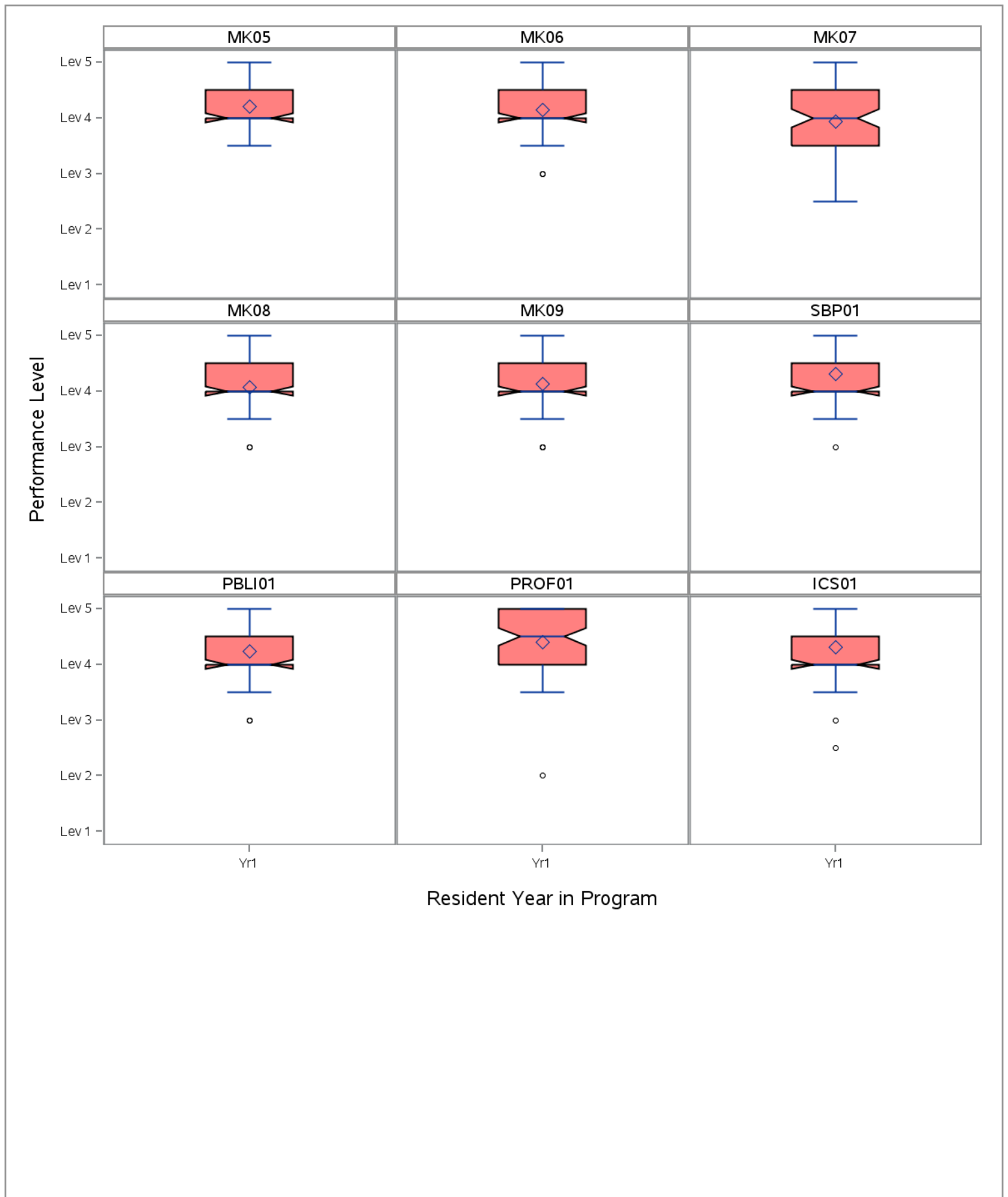
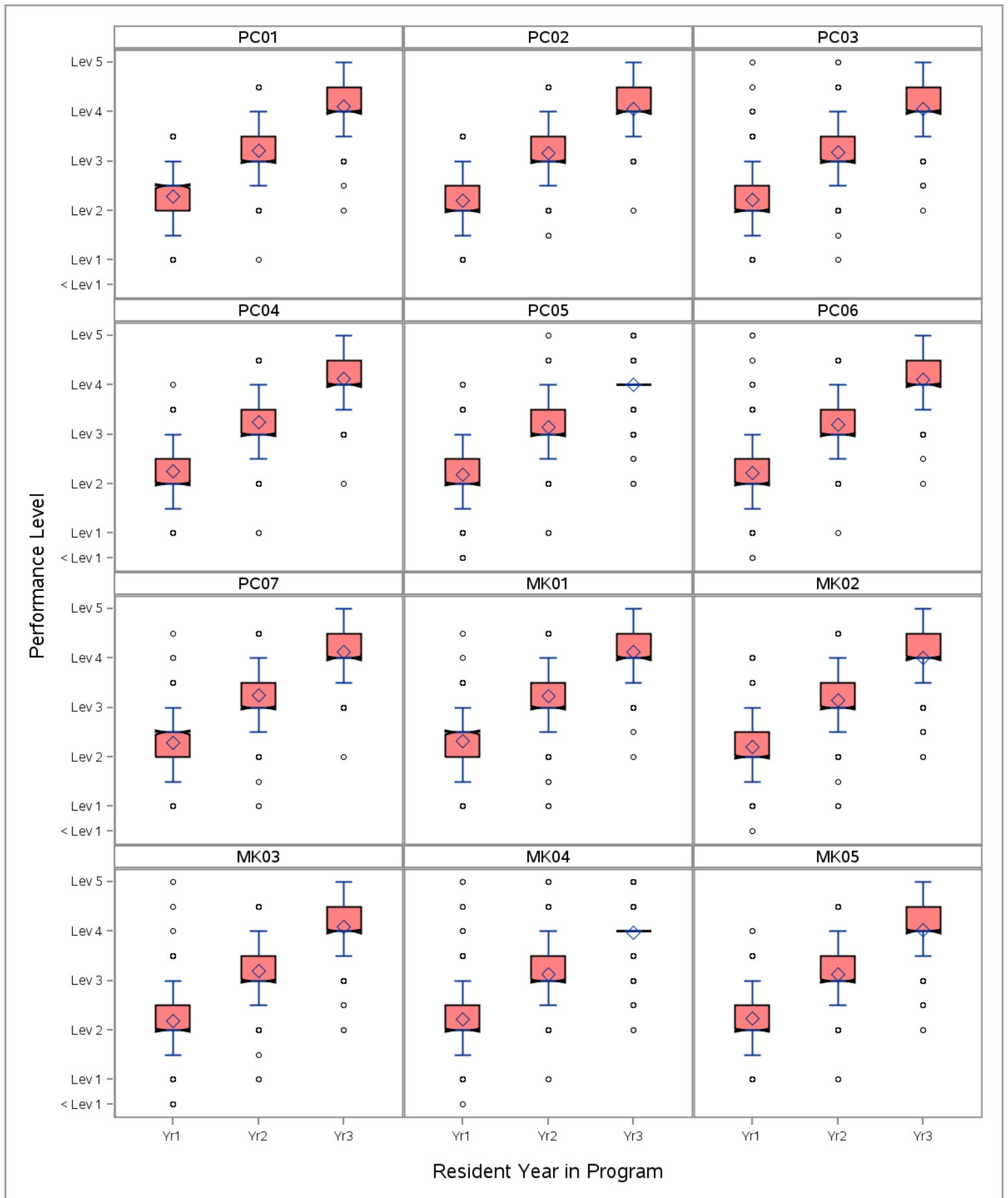
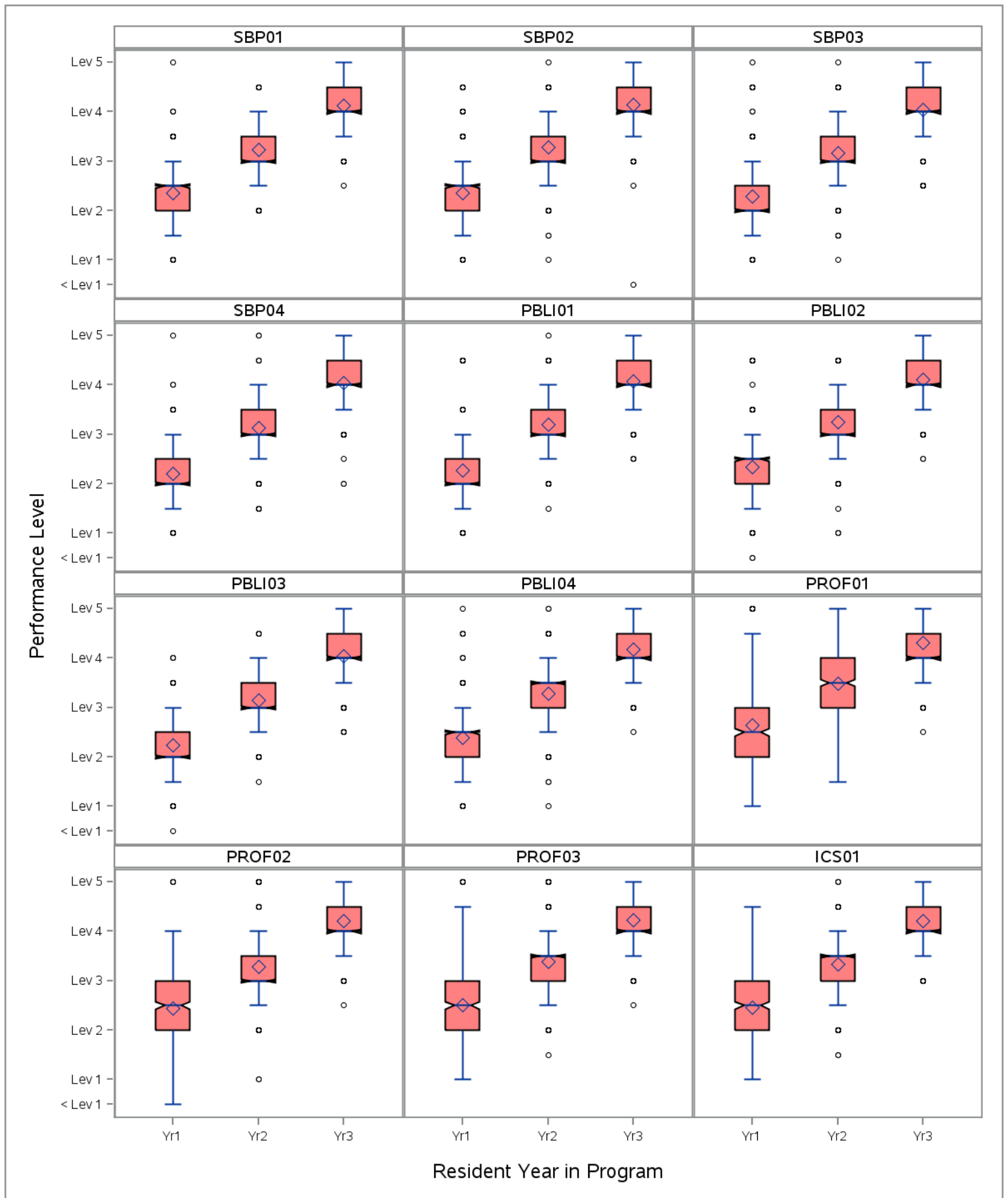


Table 12 - Dermatology (June 2017)



Continue to next page for Dermatology

Table 12 - Dermatology (June 2017)



Continue to next page for Dermatology

Table 12 - Dermatology (June 2017)

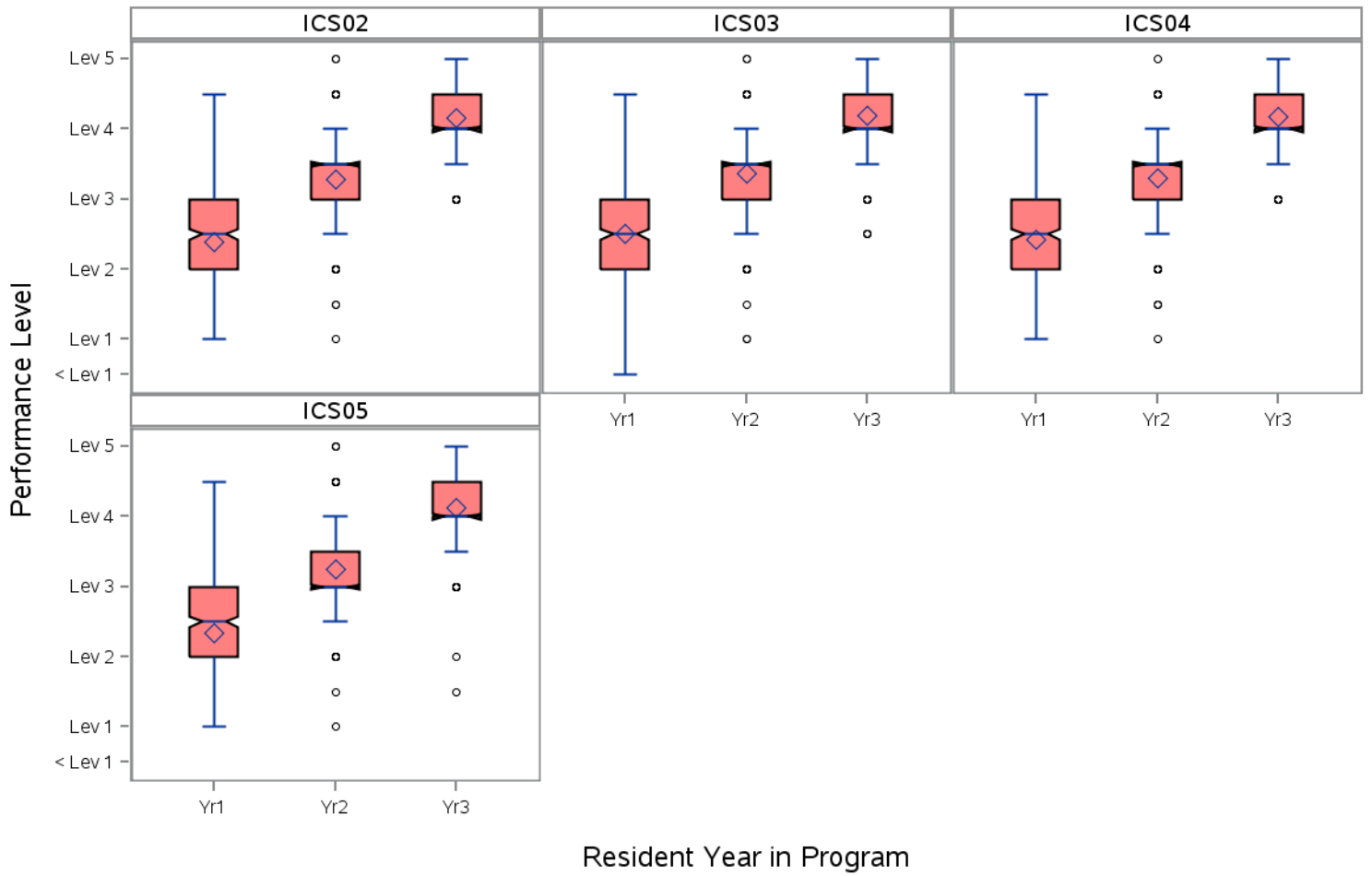


Table 13 - Dermatopathology (multidisciplinary) (June 2017)

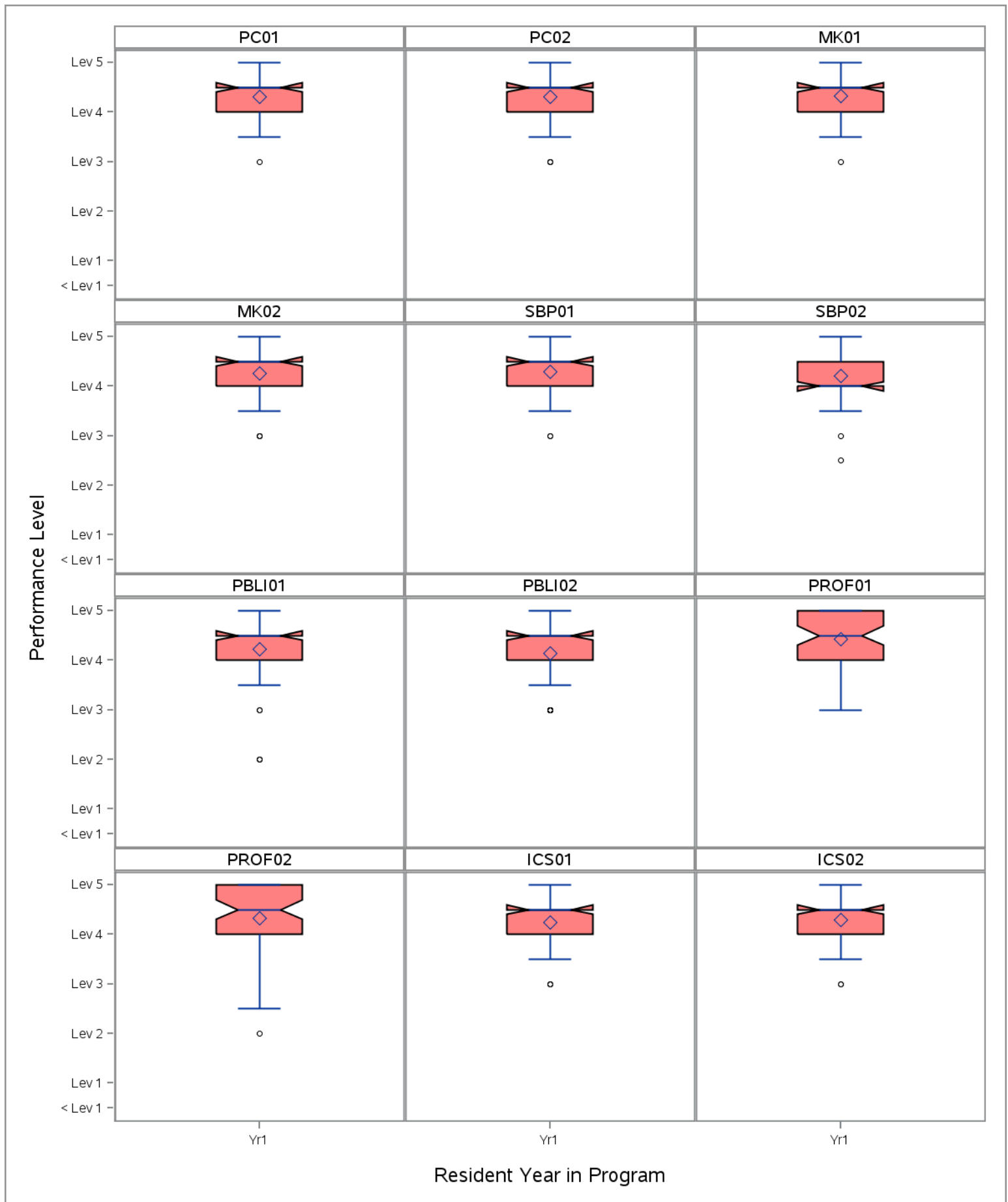
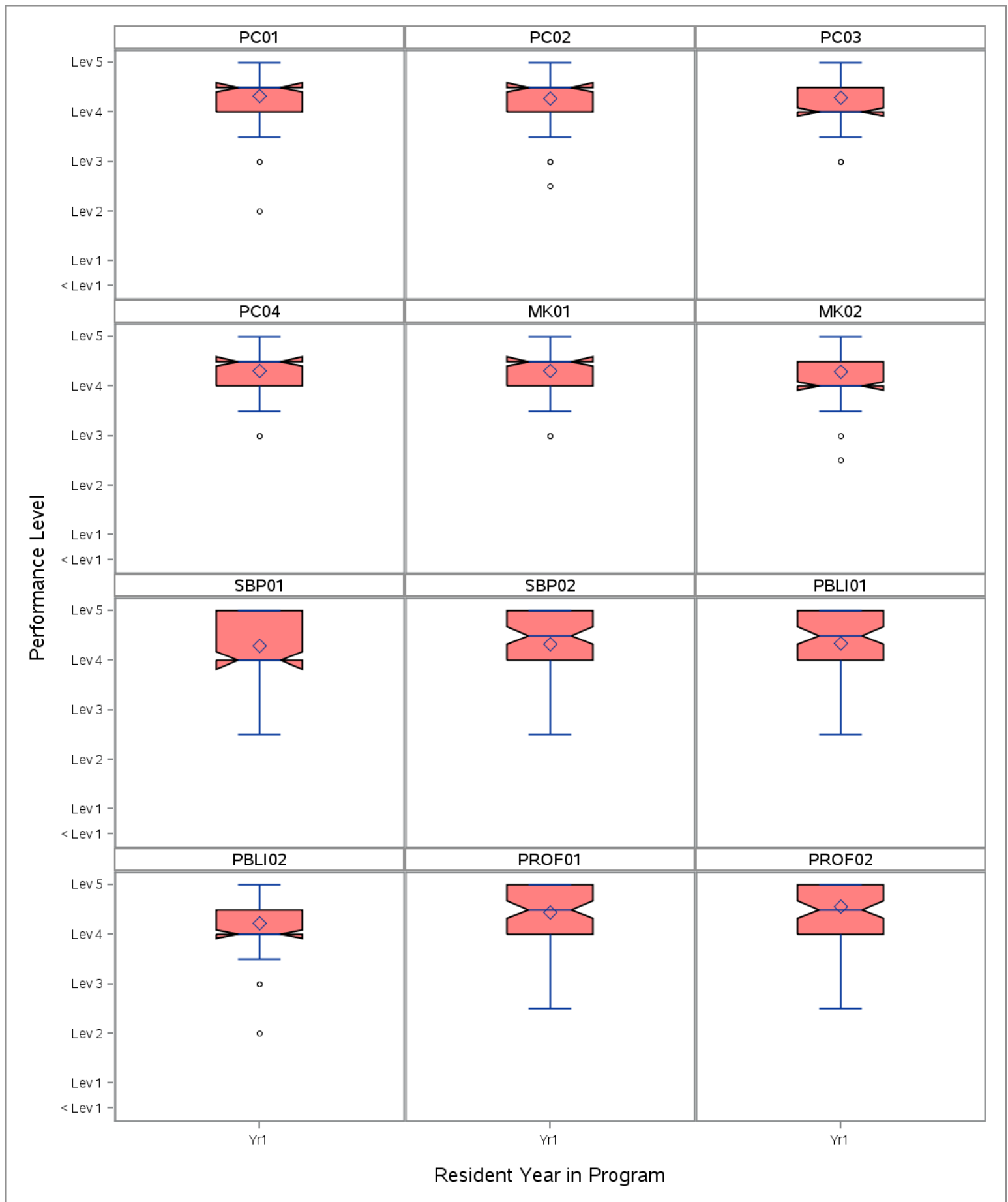


Table 14 - Micrographic surgery and dermatologic oncology (June 2017)



Continue to next page for Micrographic surgery and dermatology oncology

Table 14 - Micrographic surgery and dermatologic oncology (June 2017)

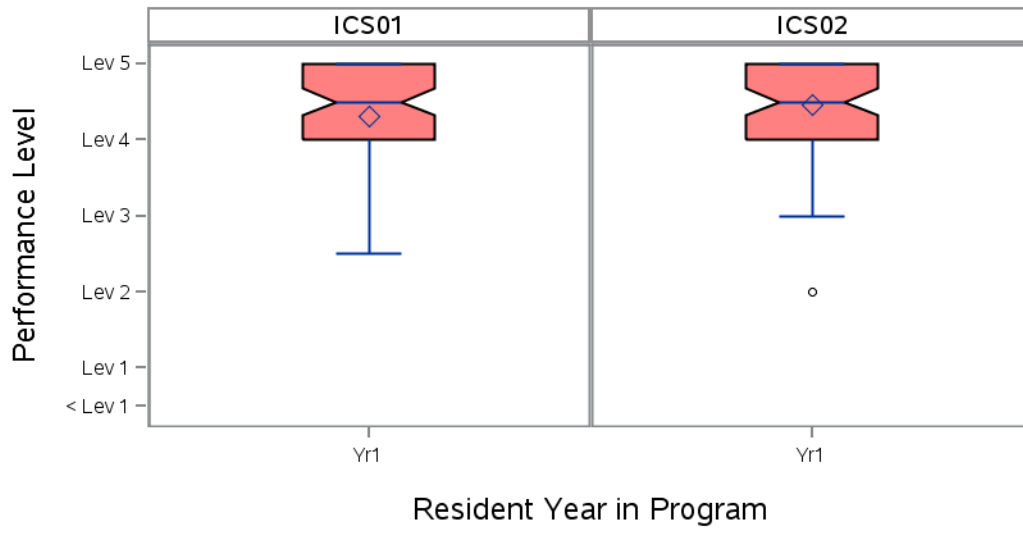
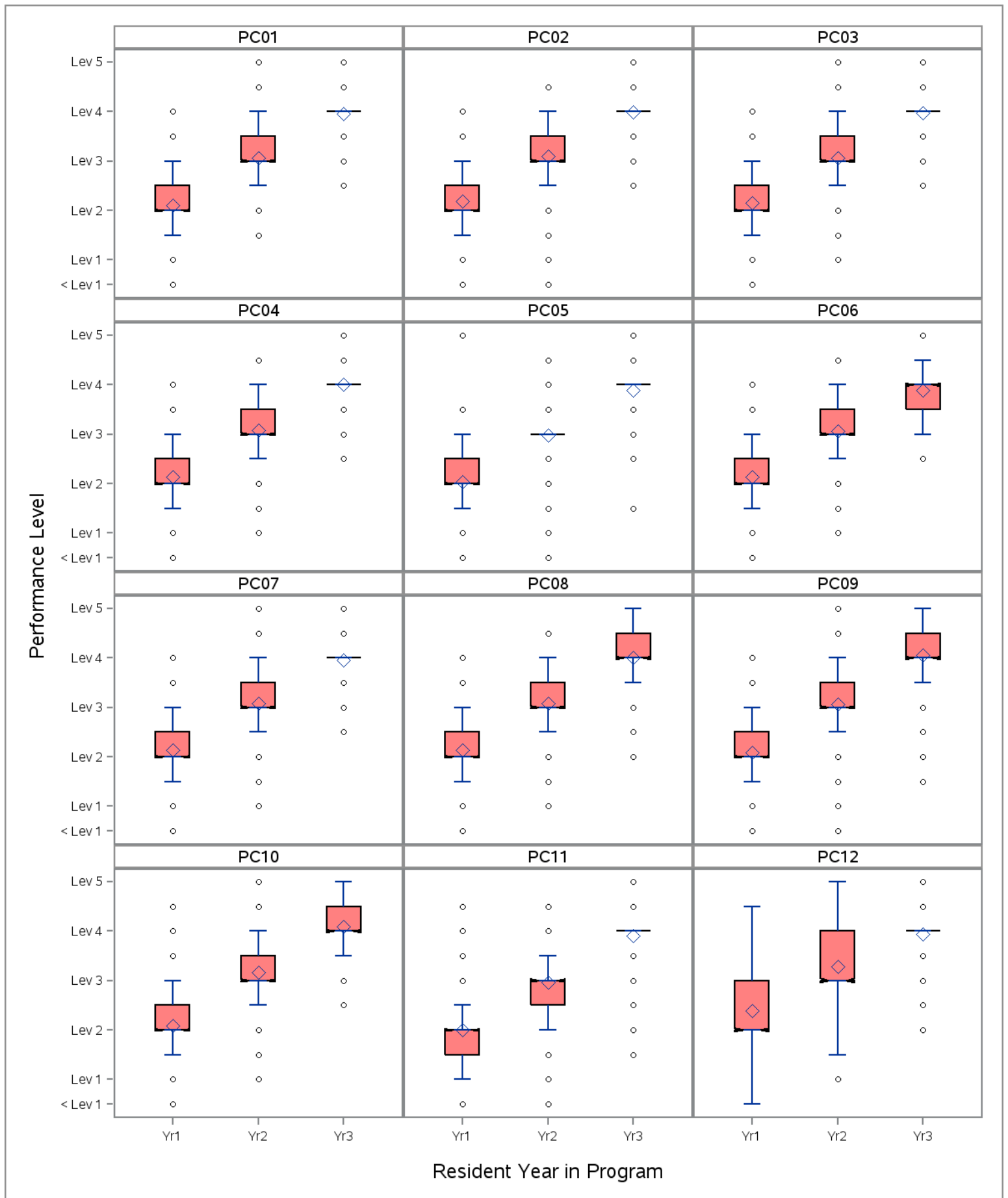
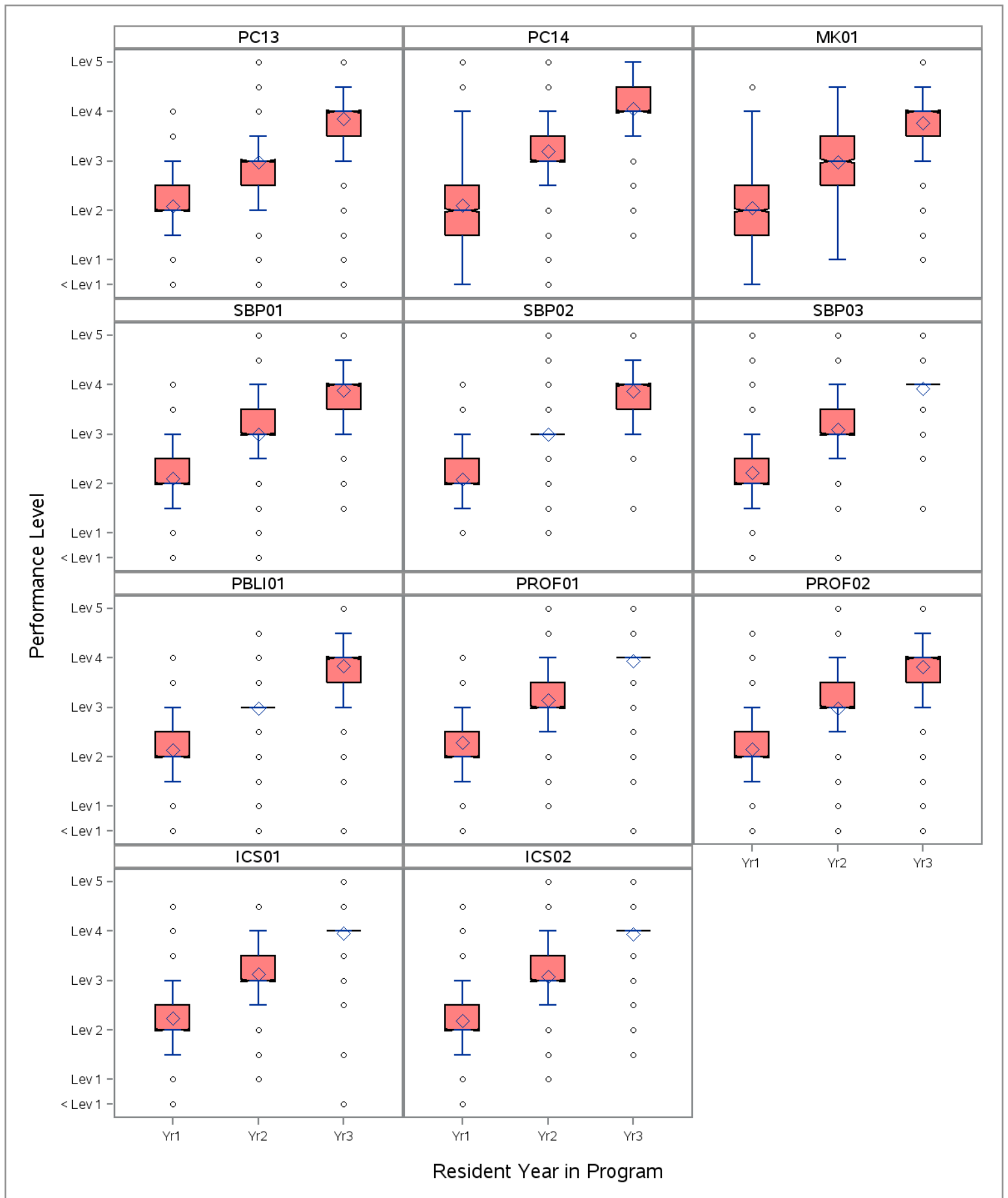


Table 15 - Emergency medicine (June 2017)



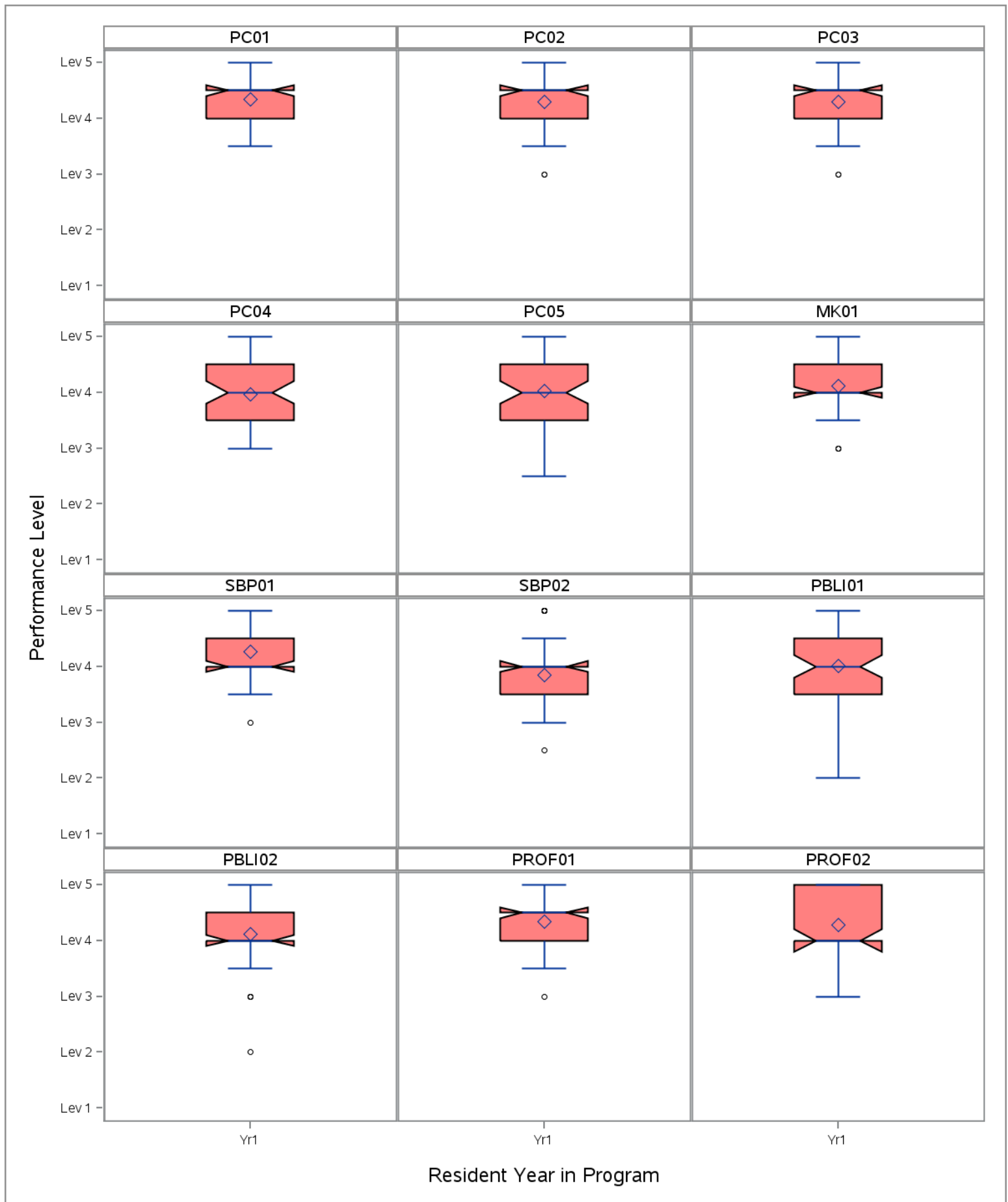
Continue to next page for Emergency medicine

Table 15 - Emergency medicine (June 2017)



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Table 16 - Emergency medical services (June 2017)



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Table 16 - Emergency medical services (June 2017)

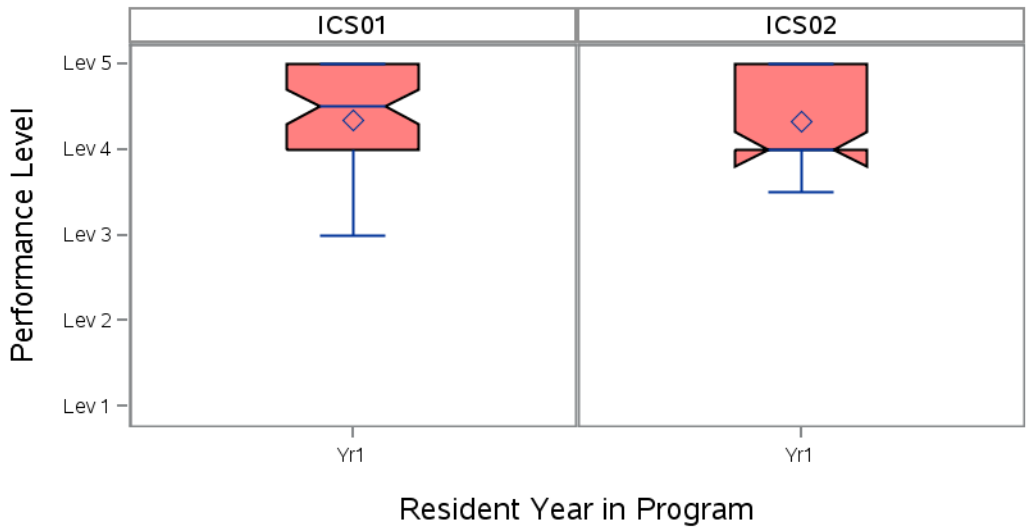
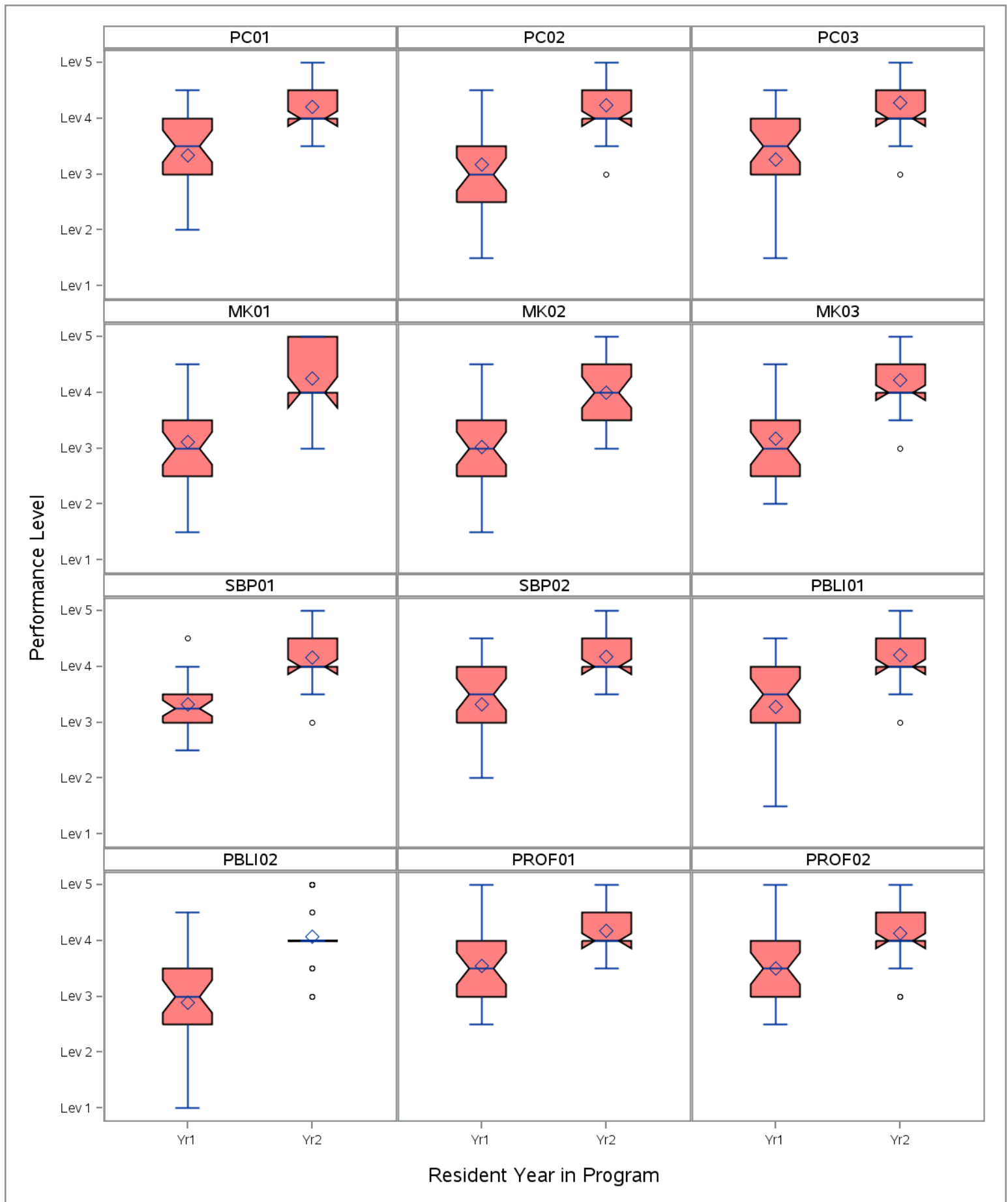


Table 17 - Medical toxicology (June 2017)



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Table 17 - Medical toxicology (June 2017)

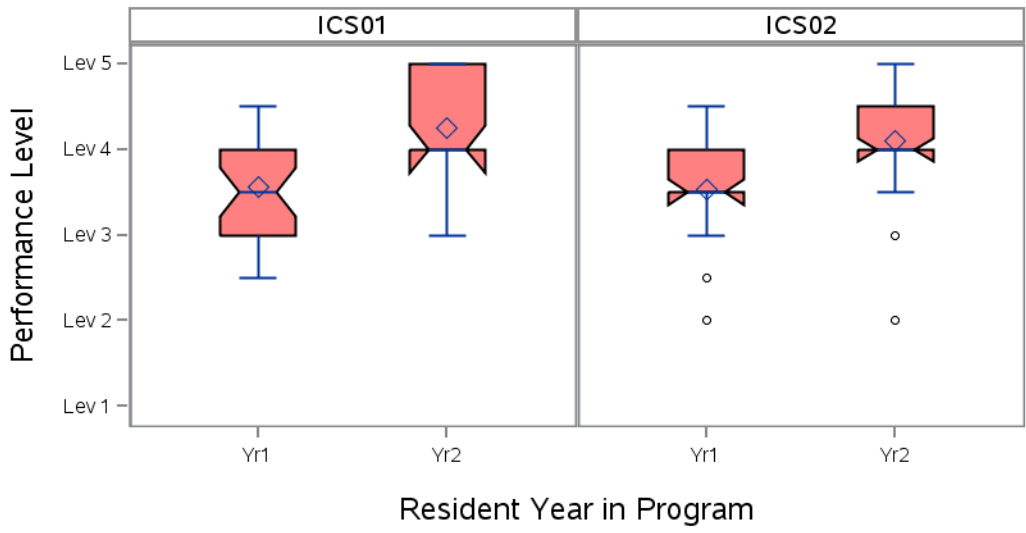
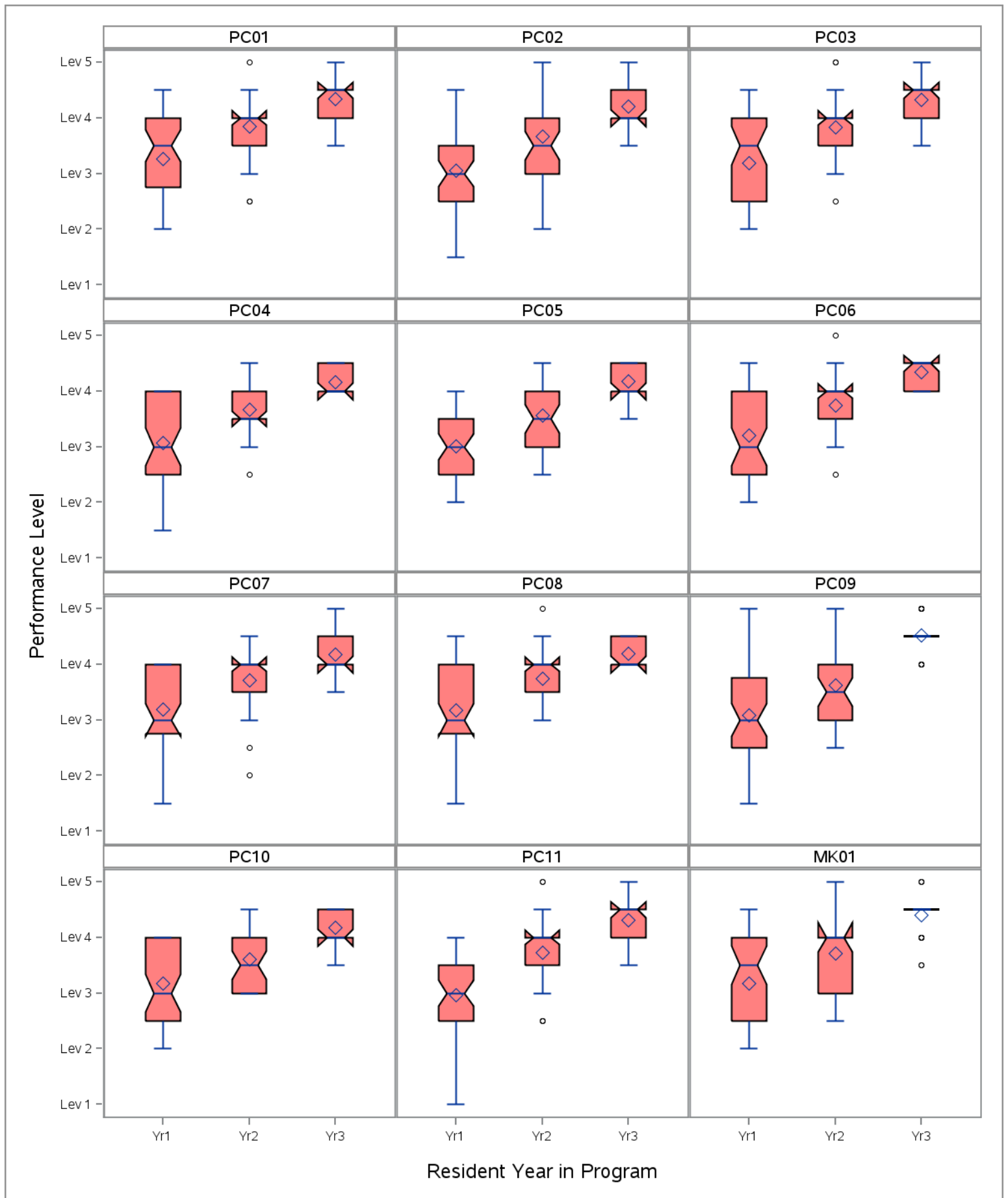
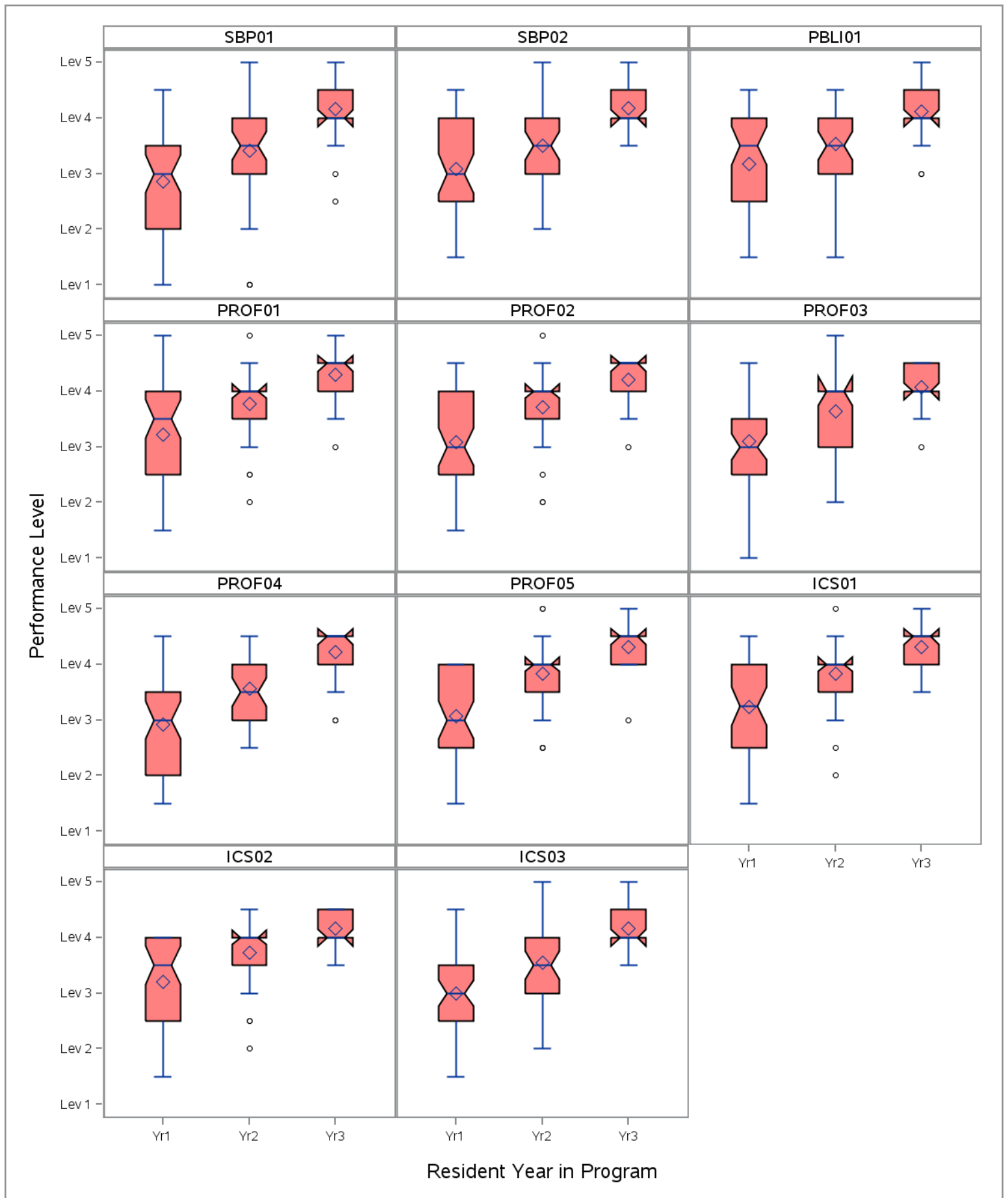


Table 18 - Pediatric emergency medicine (June 2017)



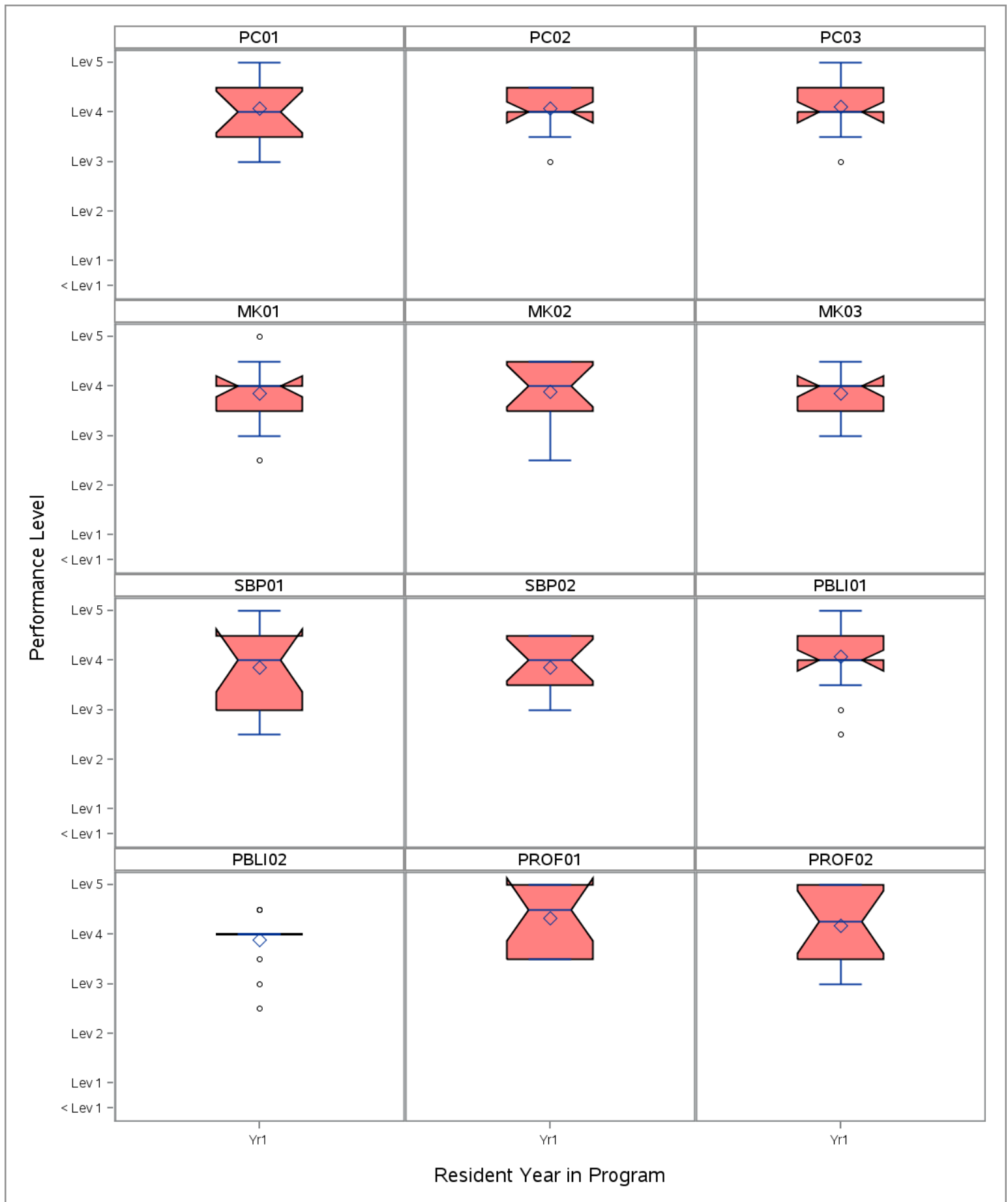
Continue to next page for Pediatric emergency medicine

Table 18 - Pediatric emergency medicine (June 2017)



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Table 19 - Sports medicine (June 2017)



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Table 19 - Sports medicine (June 2017)

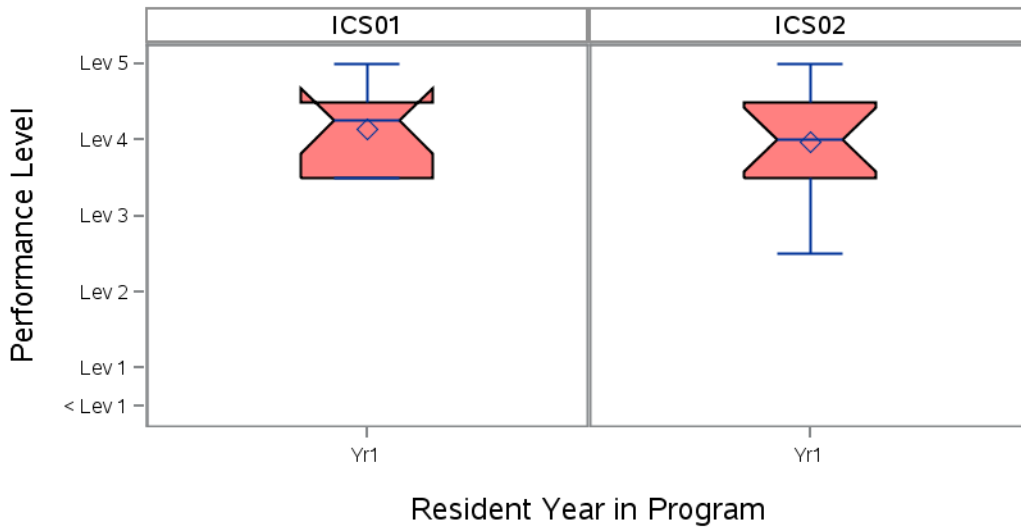
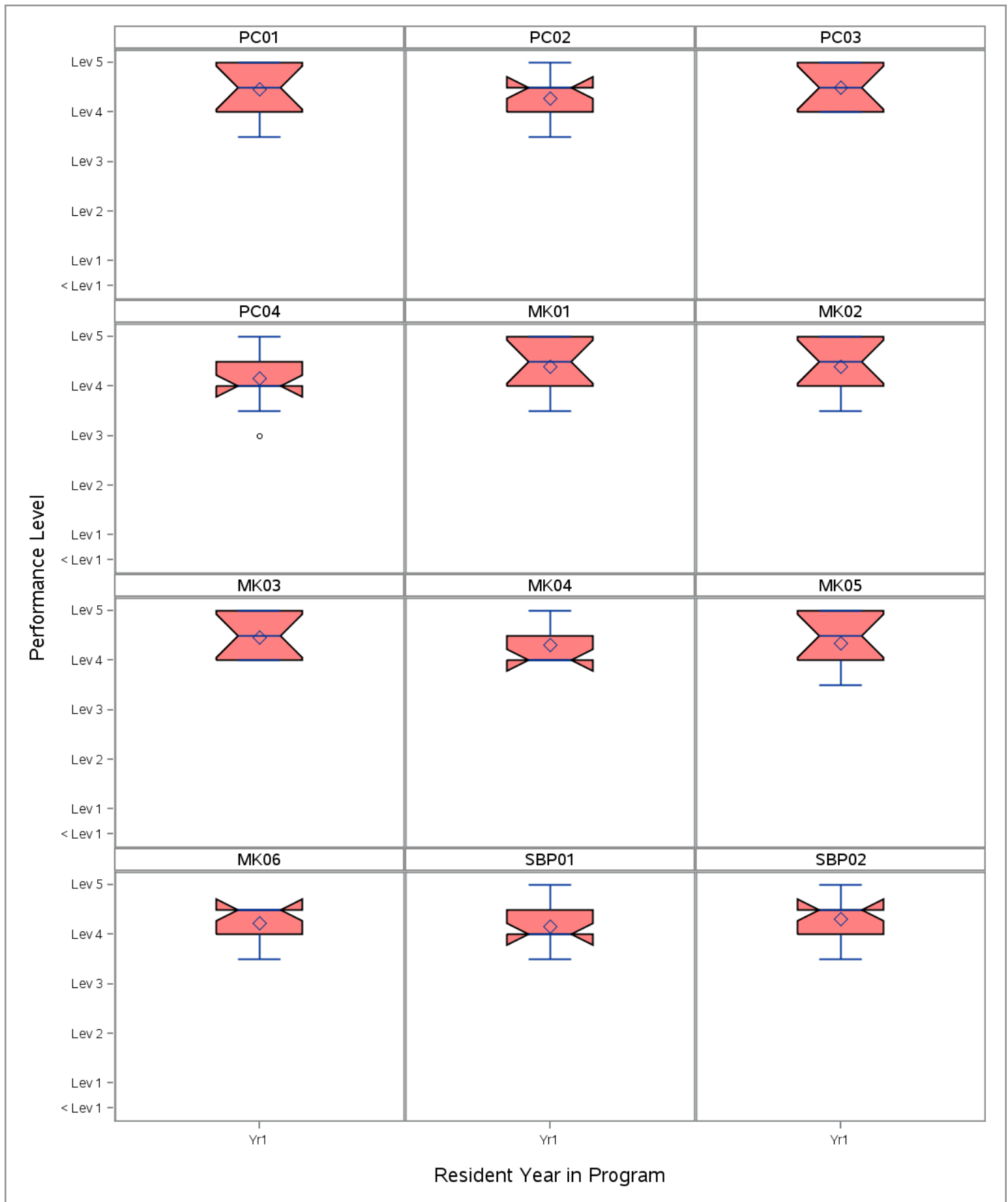


Table 20 - Undersea and hyperbaric medicine (June 2017)



Continue to next page for Undersea and hyperbaric medicine

Table 20 - Undersea and hyperbaric medicine (June 2017)

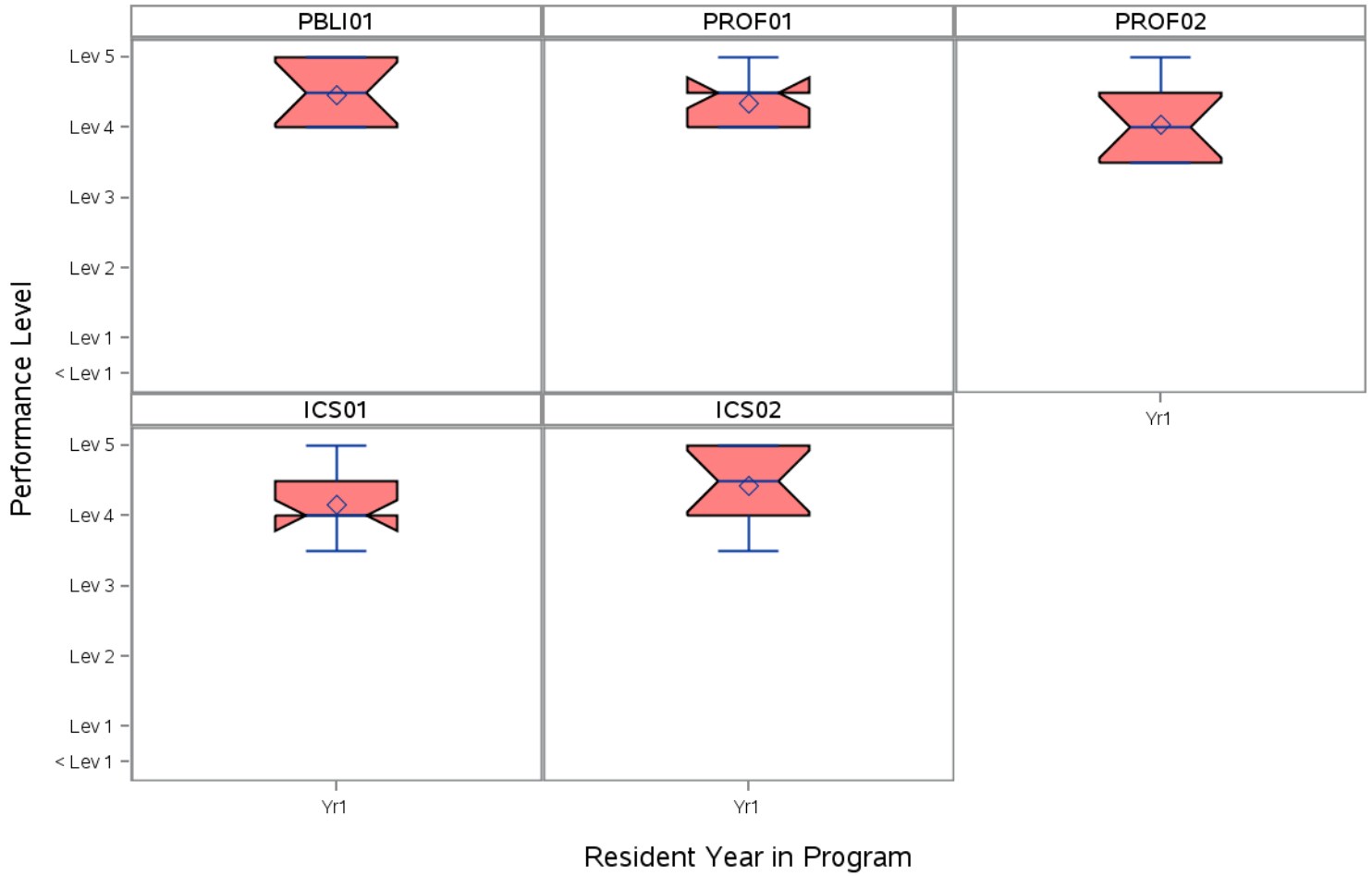
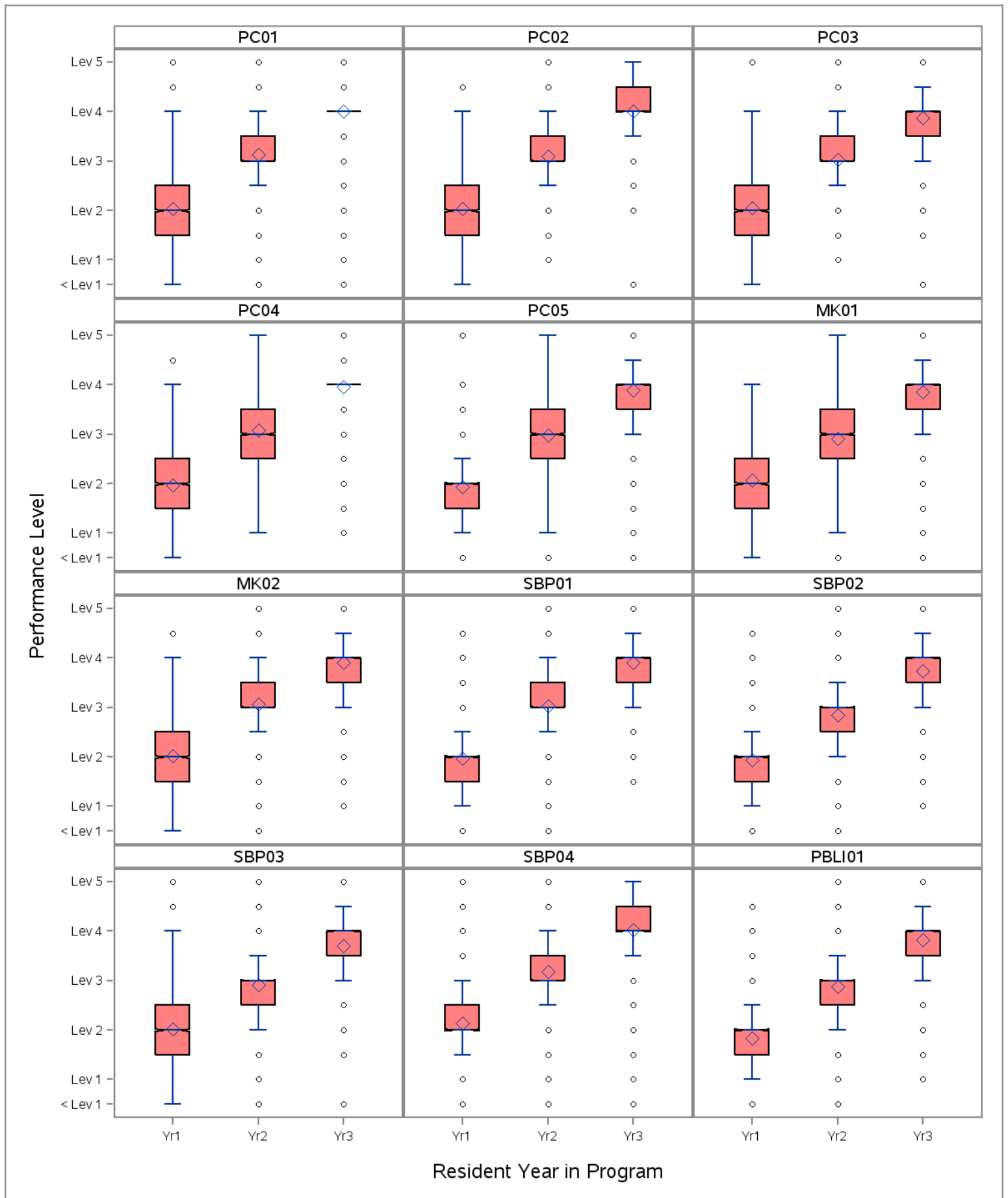
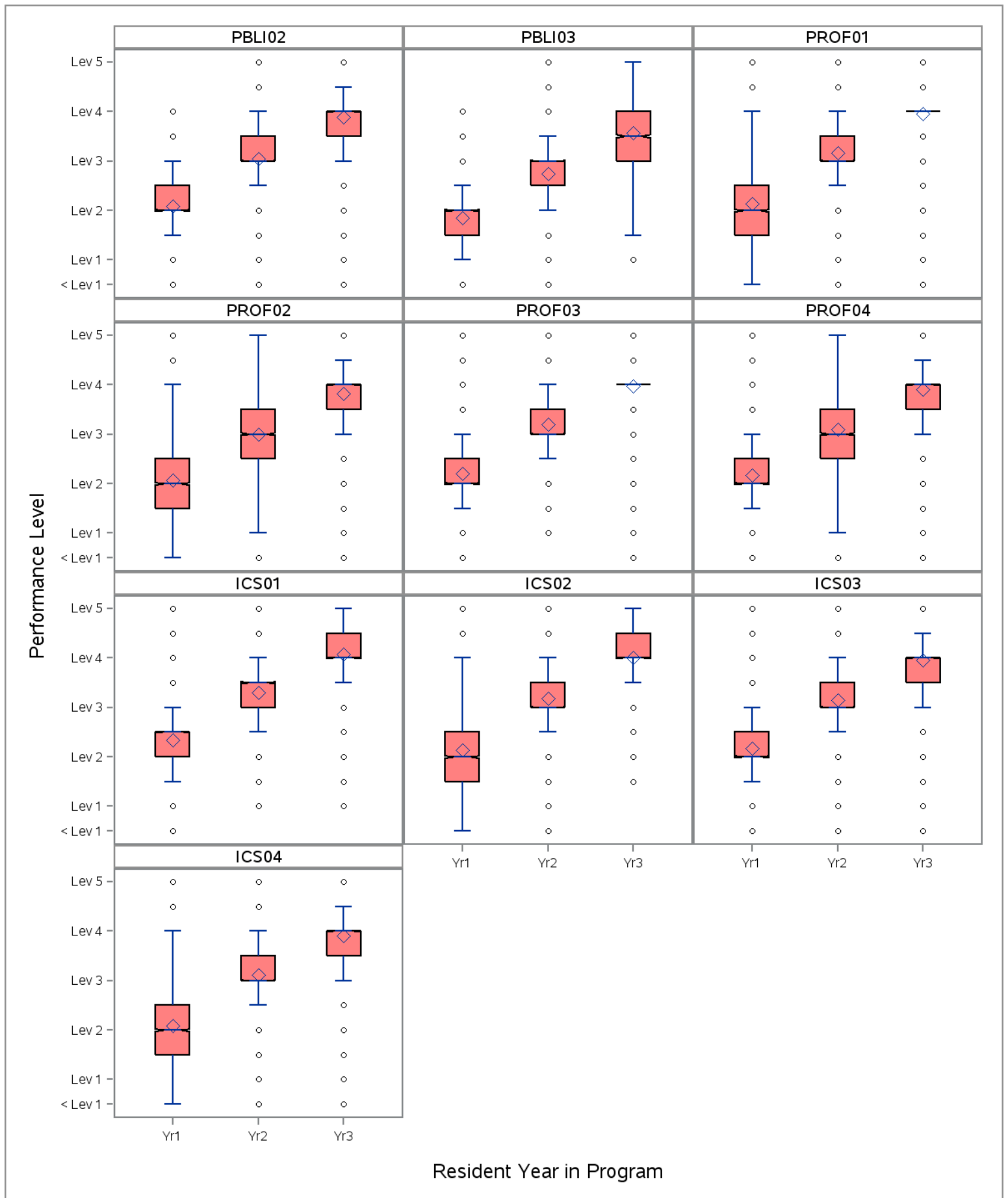


Table 21 - Family medicine (June 2017)



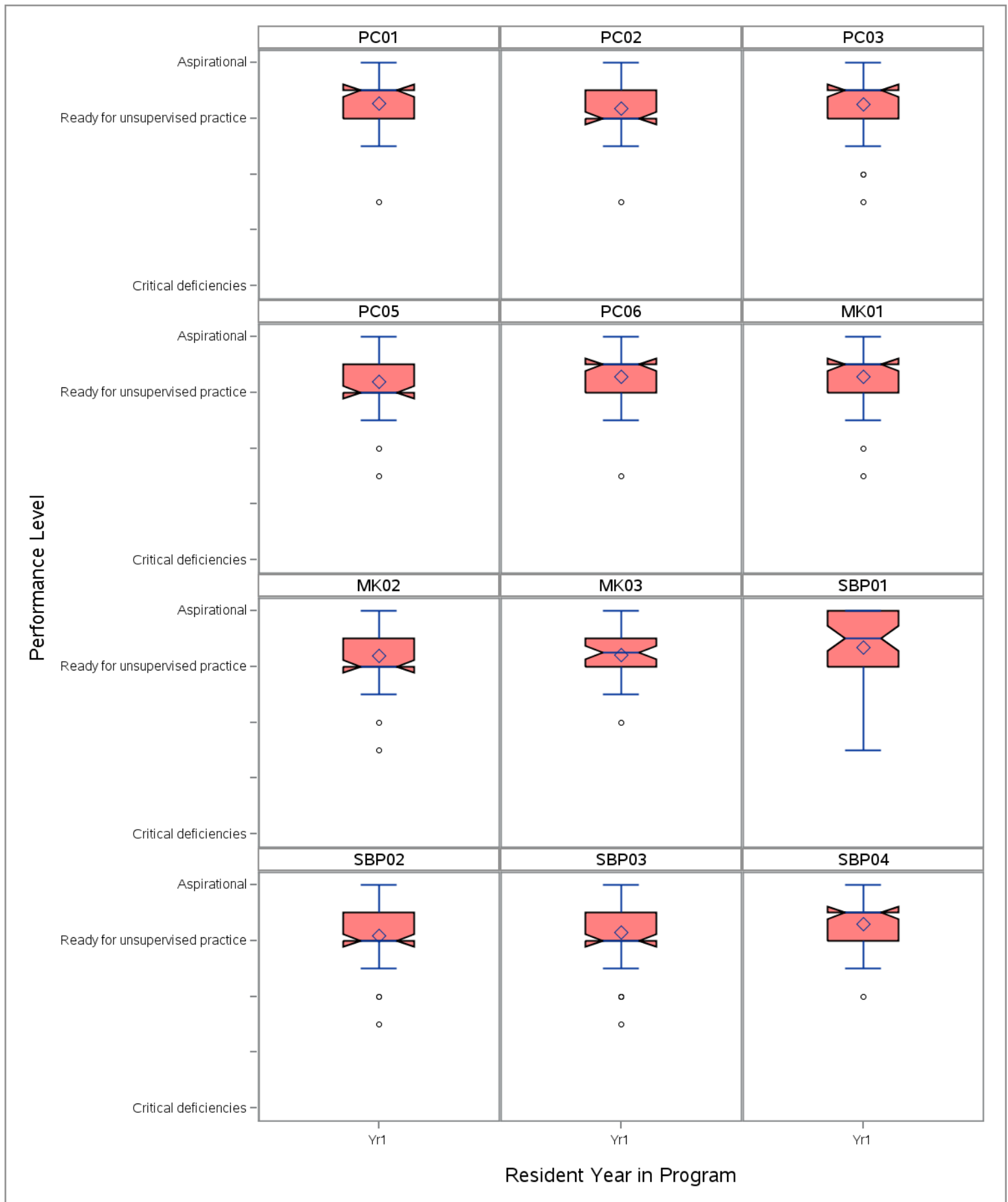
Continue to next page for Family medicine

Table 21 - Family medicine (June 2017)



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Table 22 - Geriatric medicine (June 2017)



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Table 22 - Geriatric medicine (June 2017)

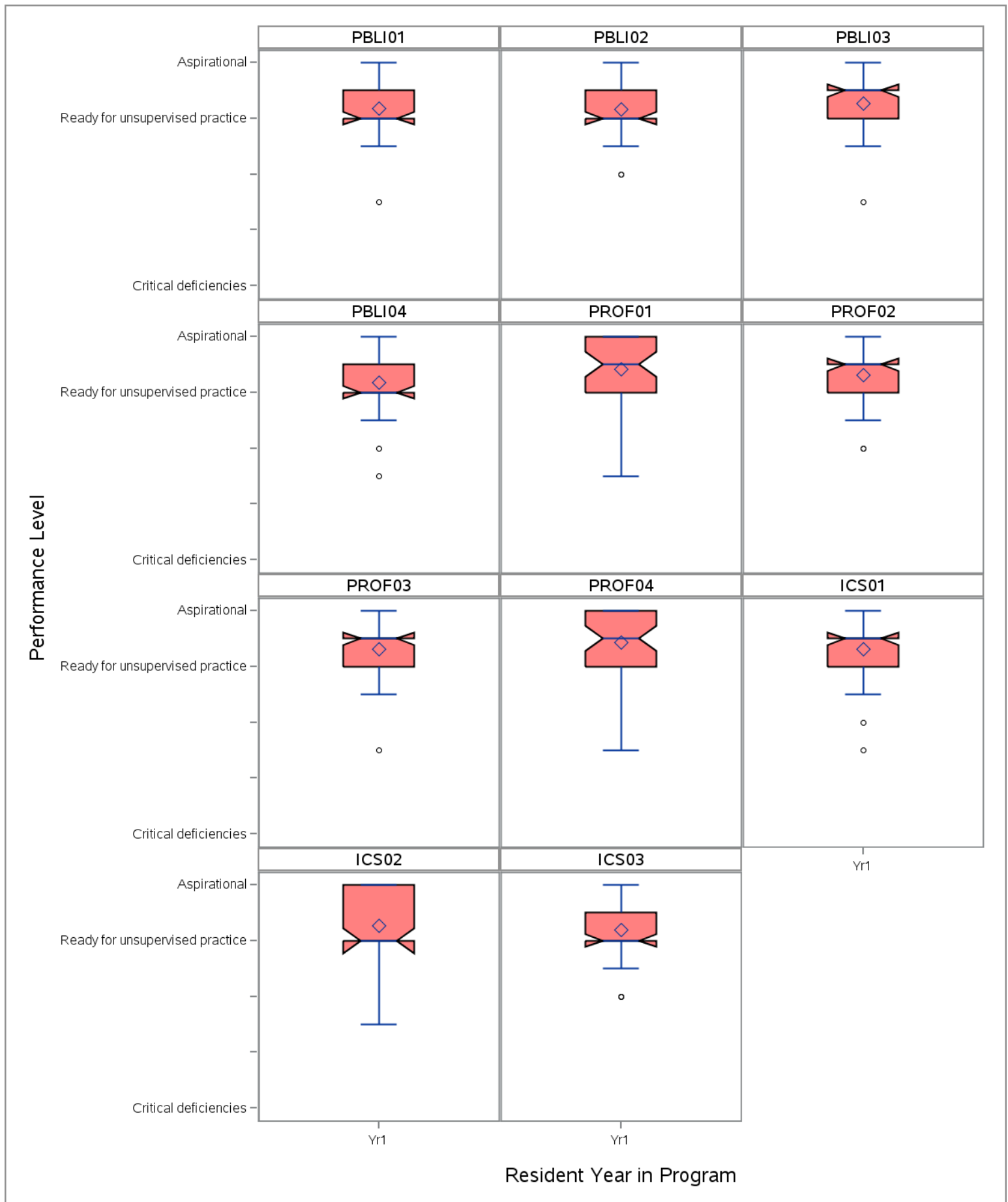
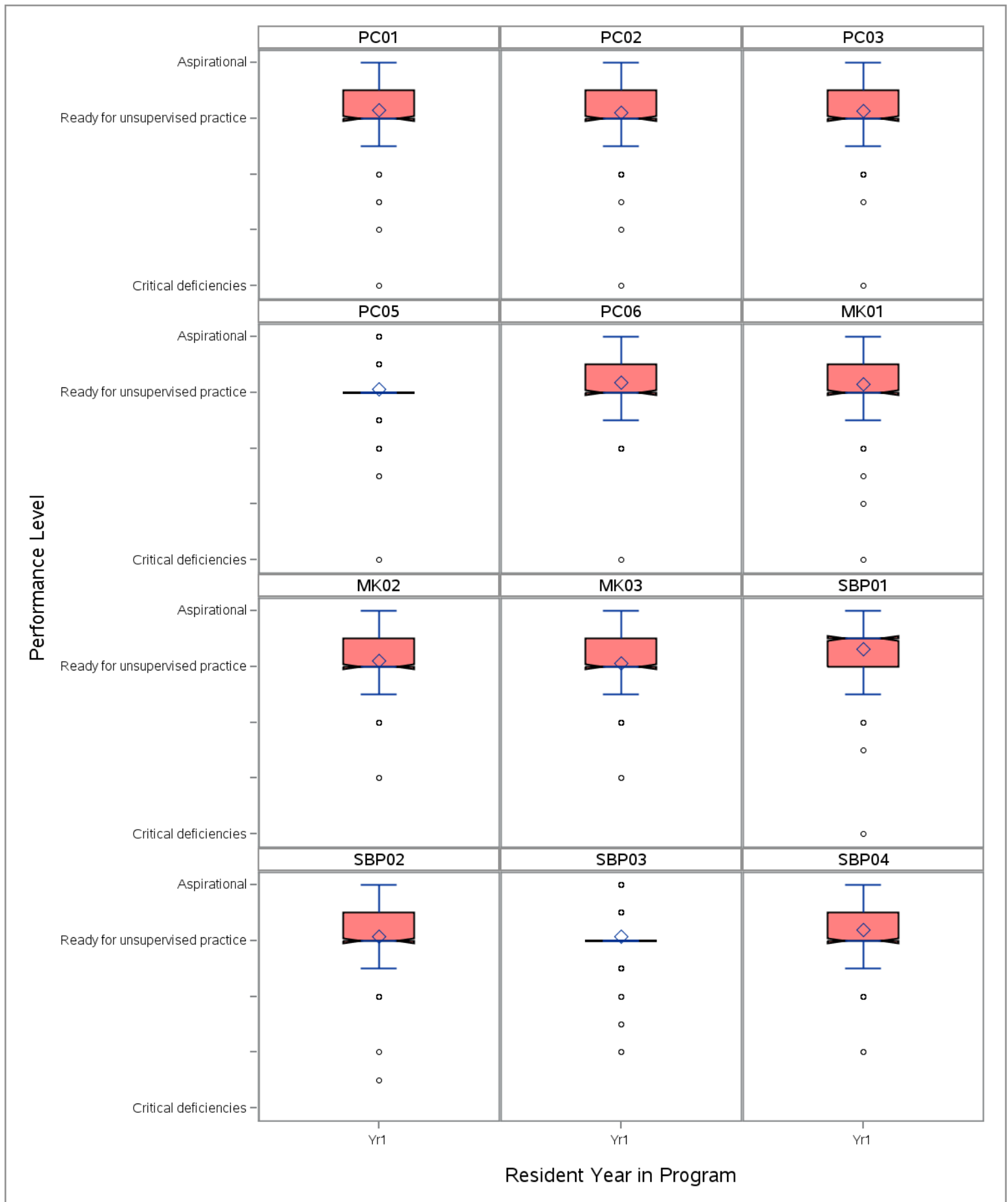


Table 23 - Hospice and palliative medicine (multidisciplinary) (June 2017)



Continue to next page for Hospice and palliative medicine (multidisciplinary)

Table 23 - Hospice and palliative medicine (multidisciplinary) (June 2017)

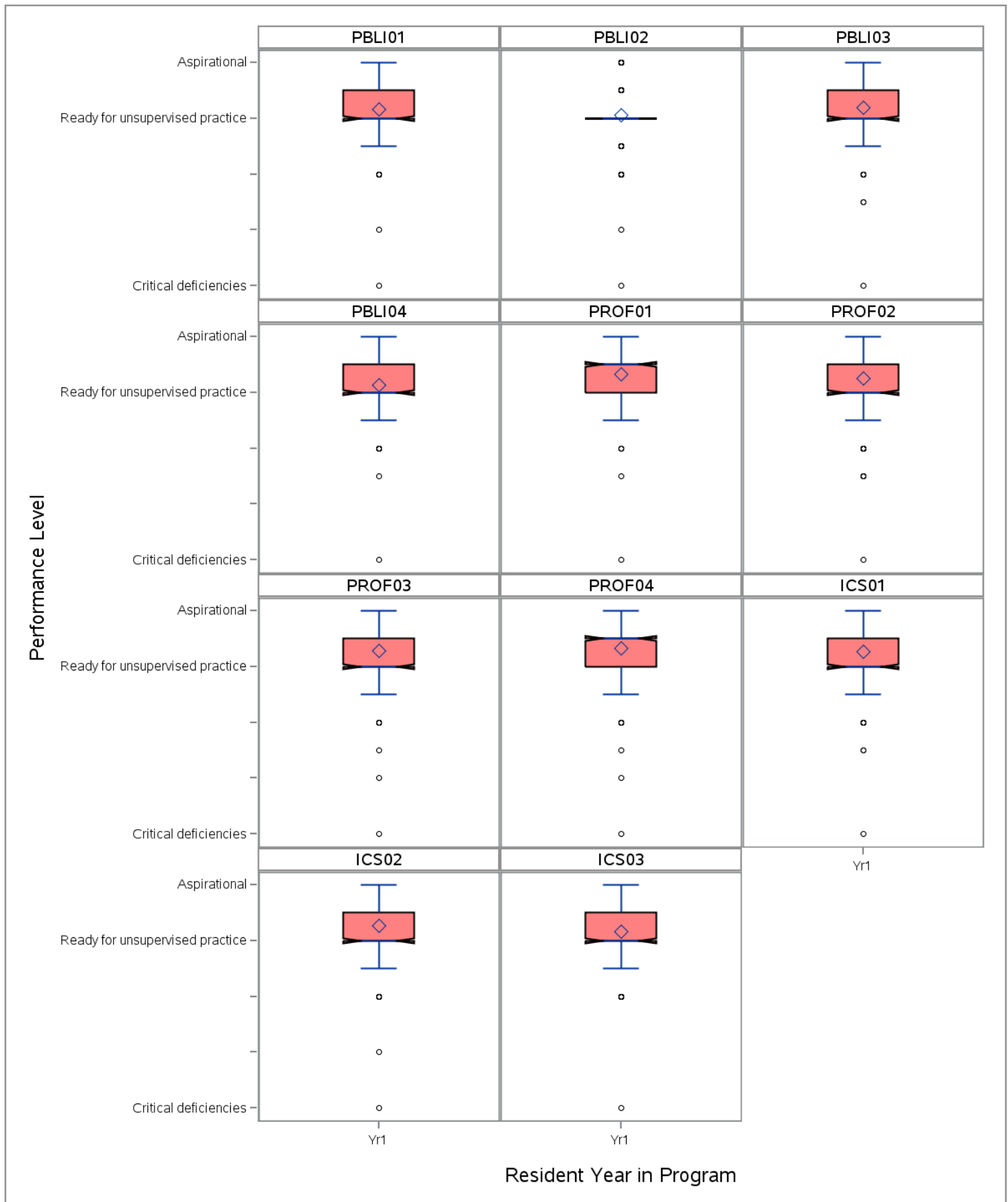
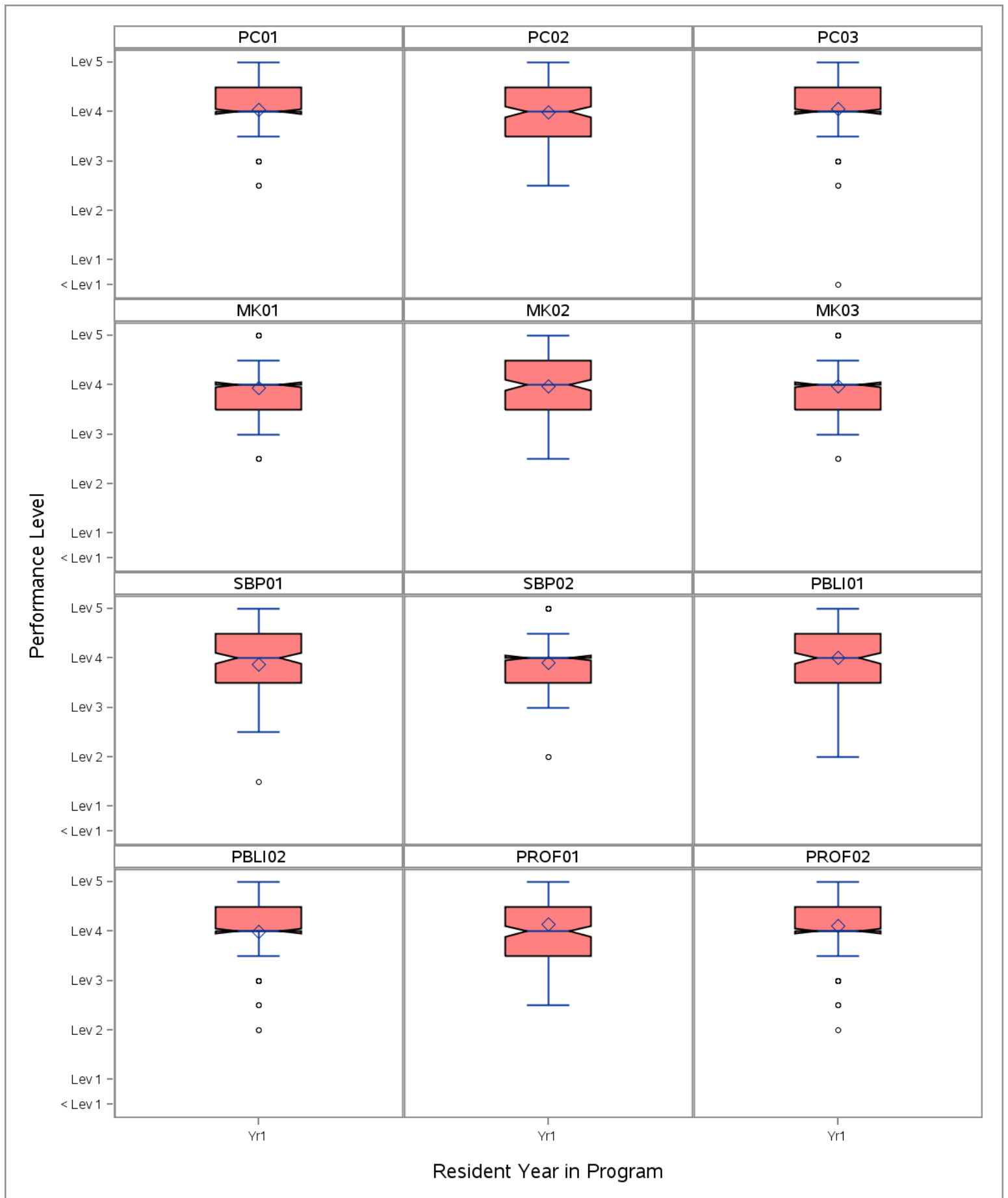


Table 24 - Sports medicine (June 2017)



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Table 24 - Sports medicine (June 2017)

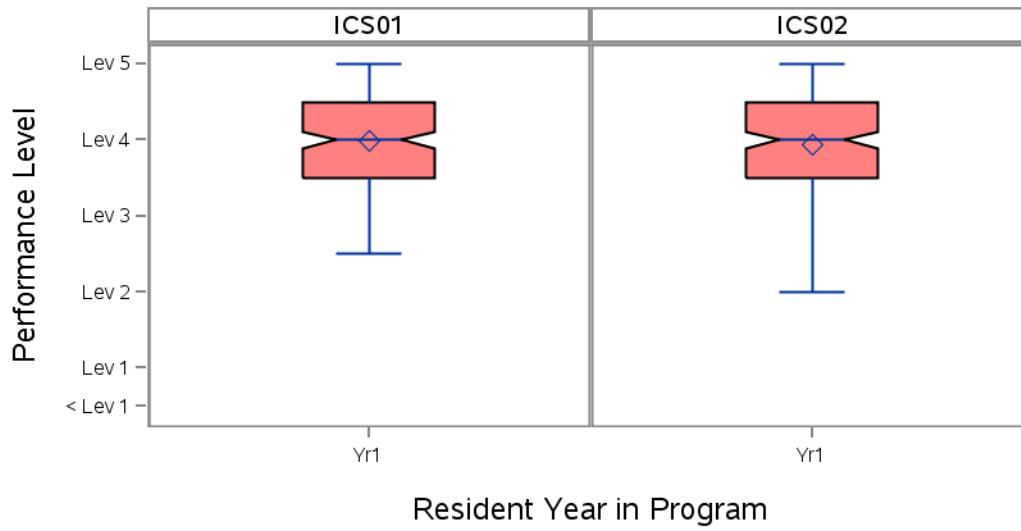
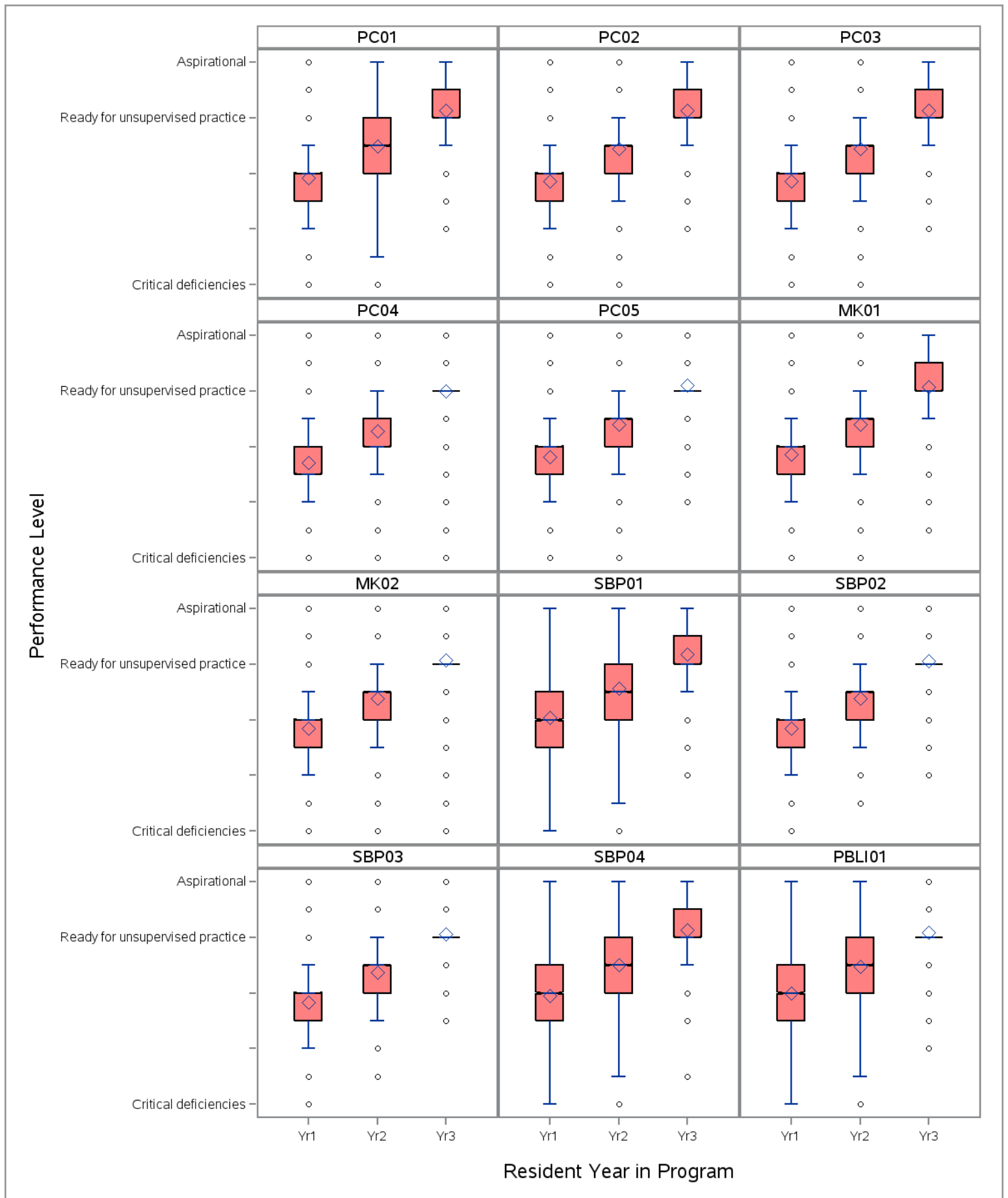


Table 25 - Internal medicine (June 2017)



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Table 25 - Internal medicine (June 2017)

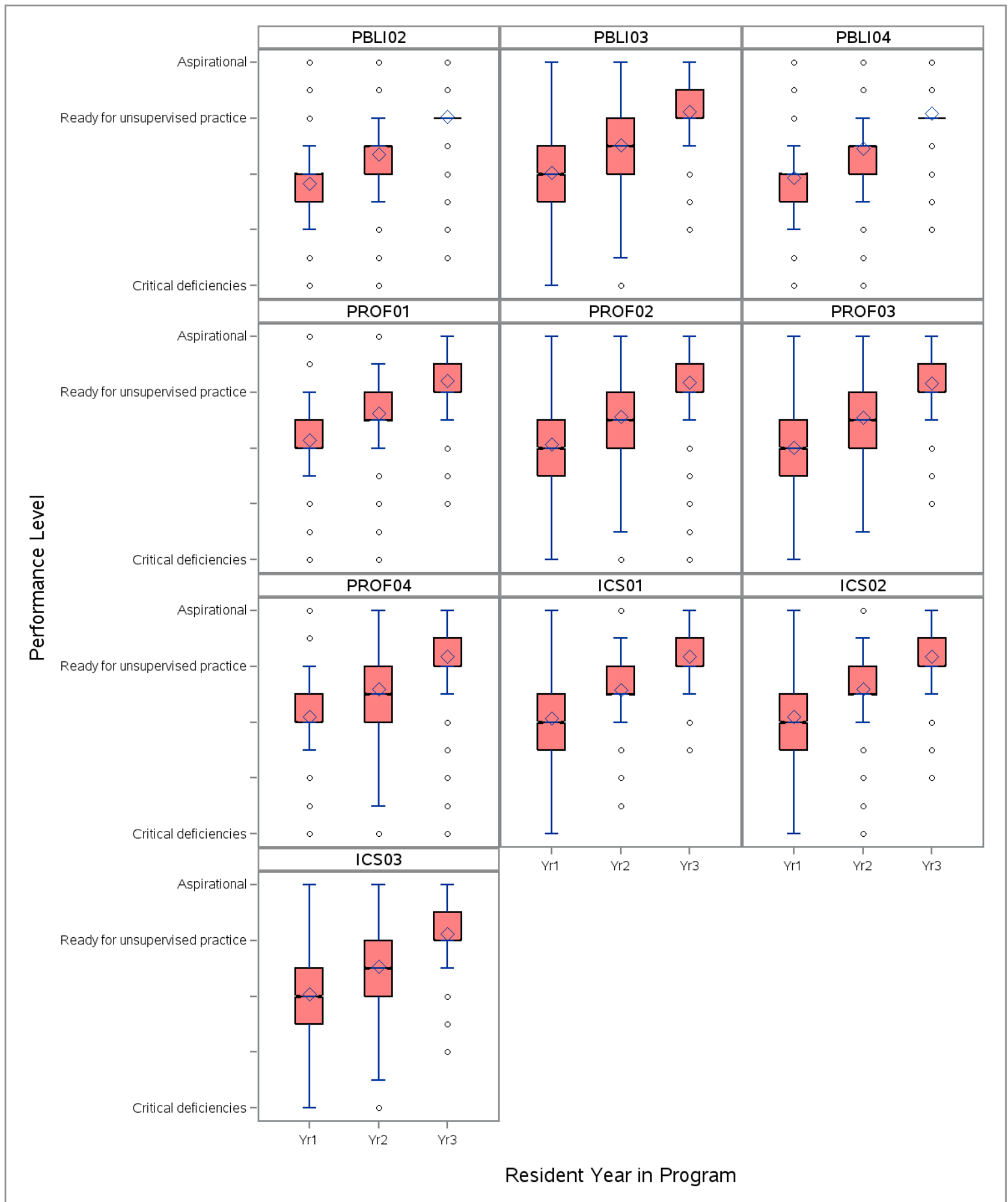
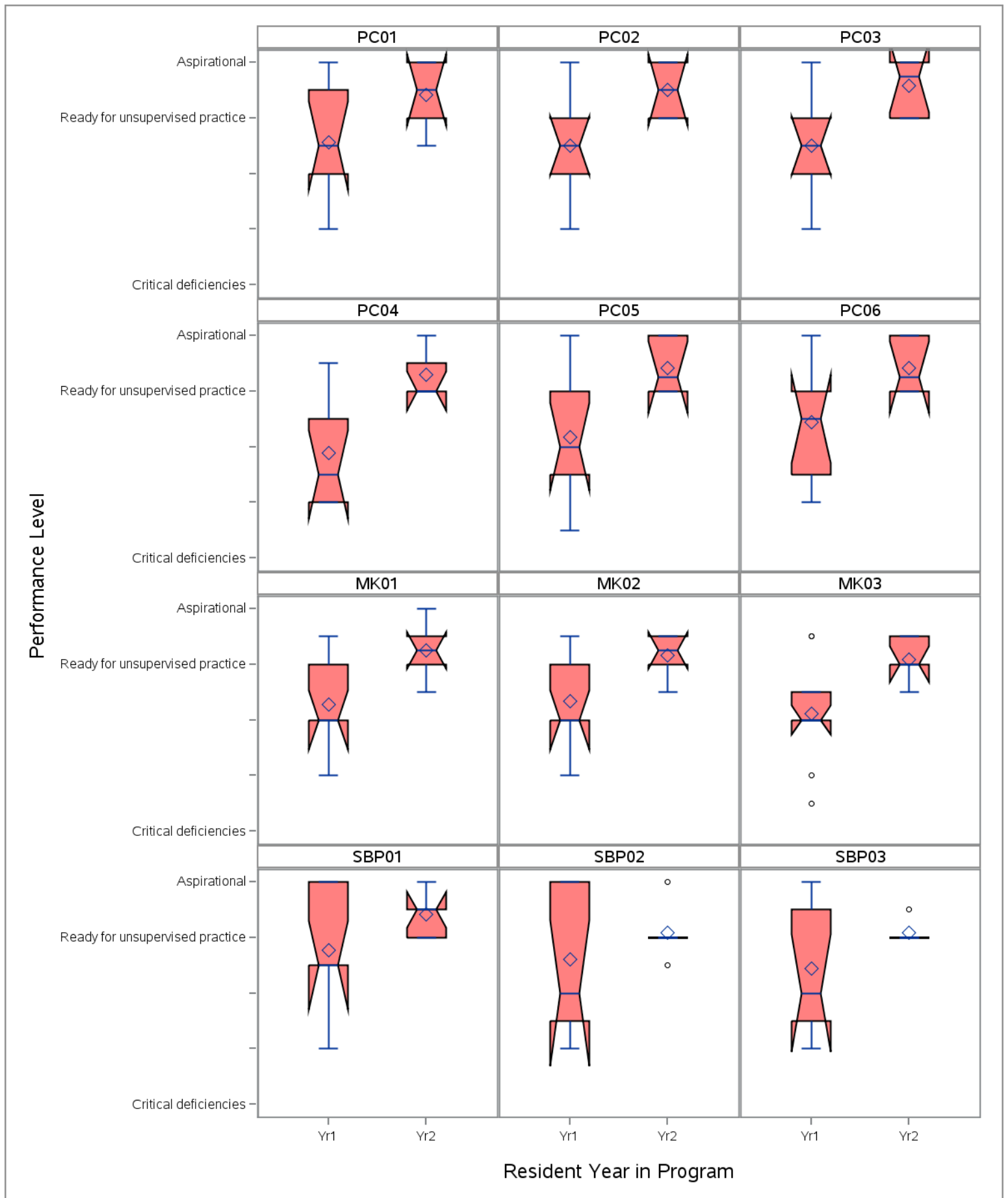
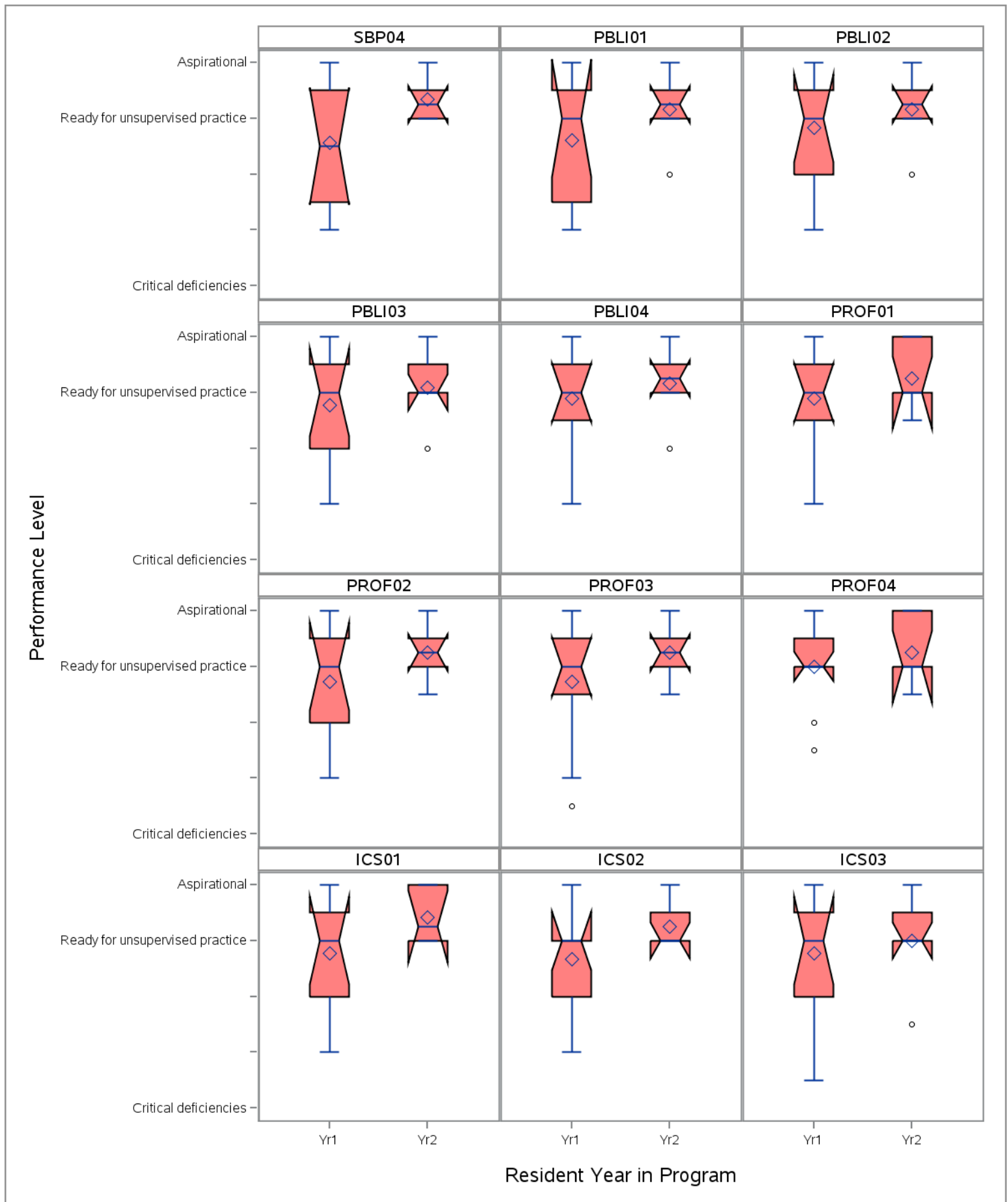


Table 26 - Adult congenital heart disease (June 2017)



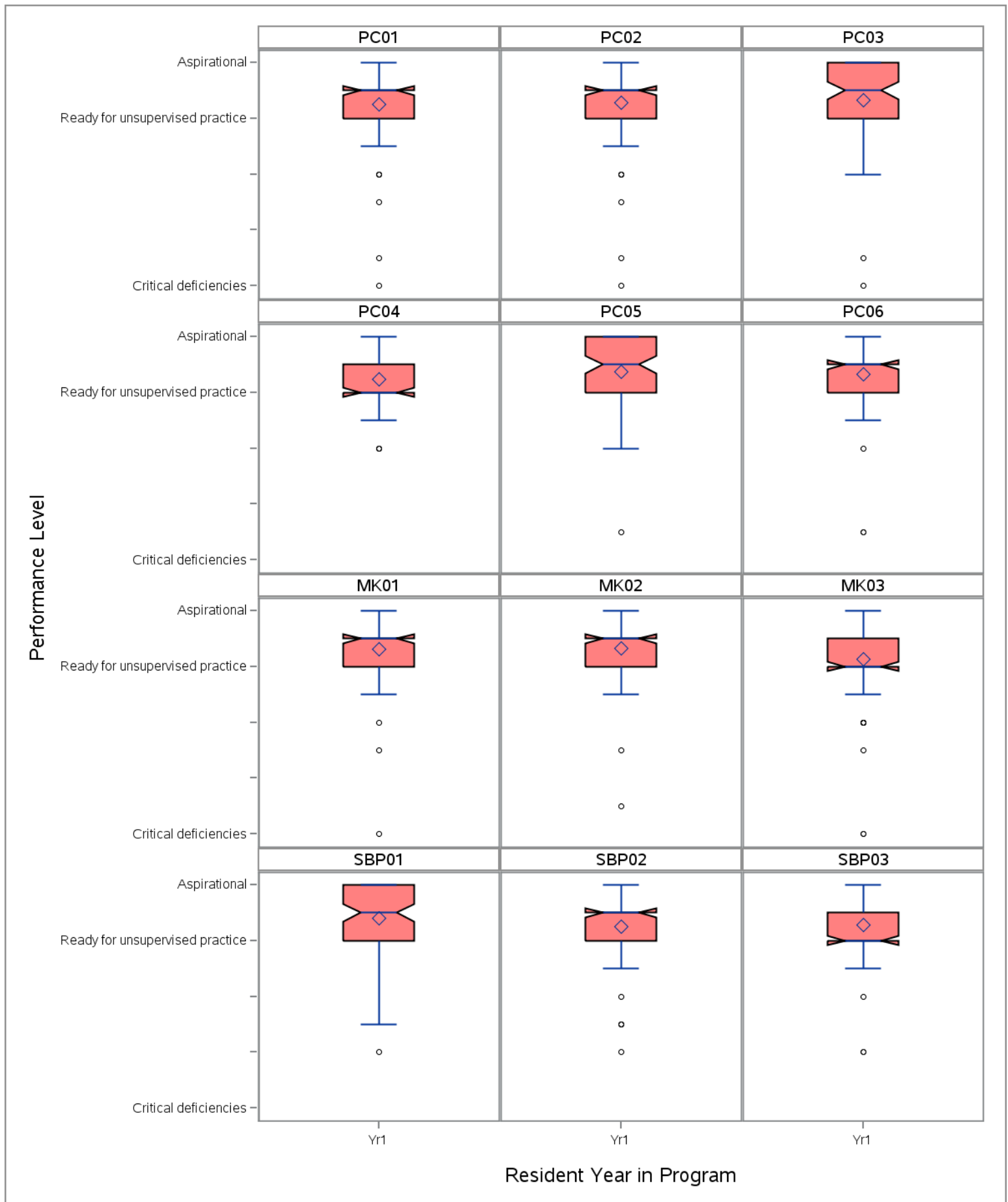
Continue to next page for Adult congenital heart disease

Table 26 - Adult congenital heart disease (June 2017)



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Table 27 - Advanced heart failure and transplant cardiology (June 2017)



Continue to next page for Advanced heart failure and transplant cardiology

Table 27 - Advanced heart failure and transplant cardiology (June 2017)

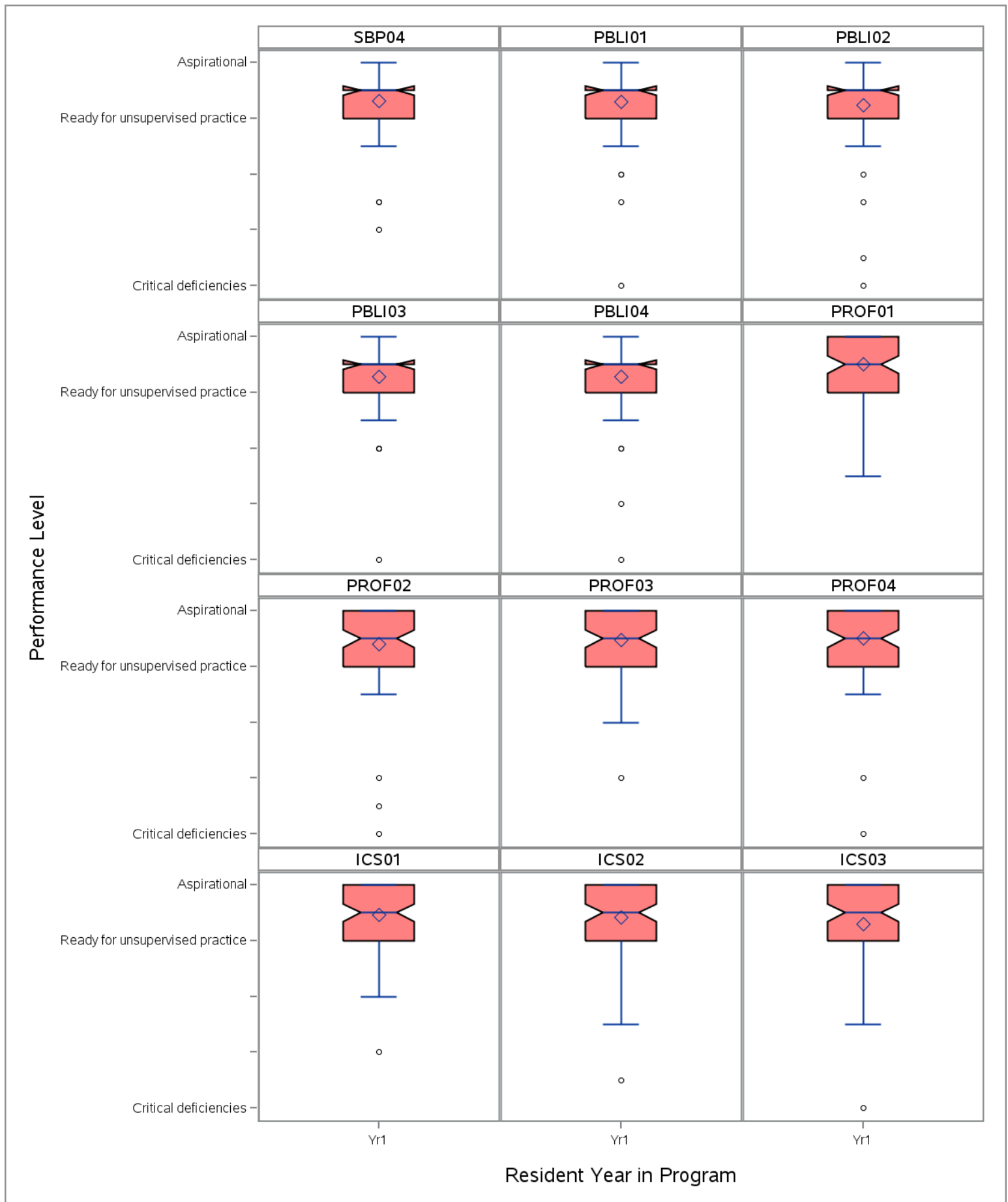
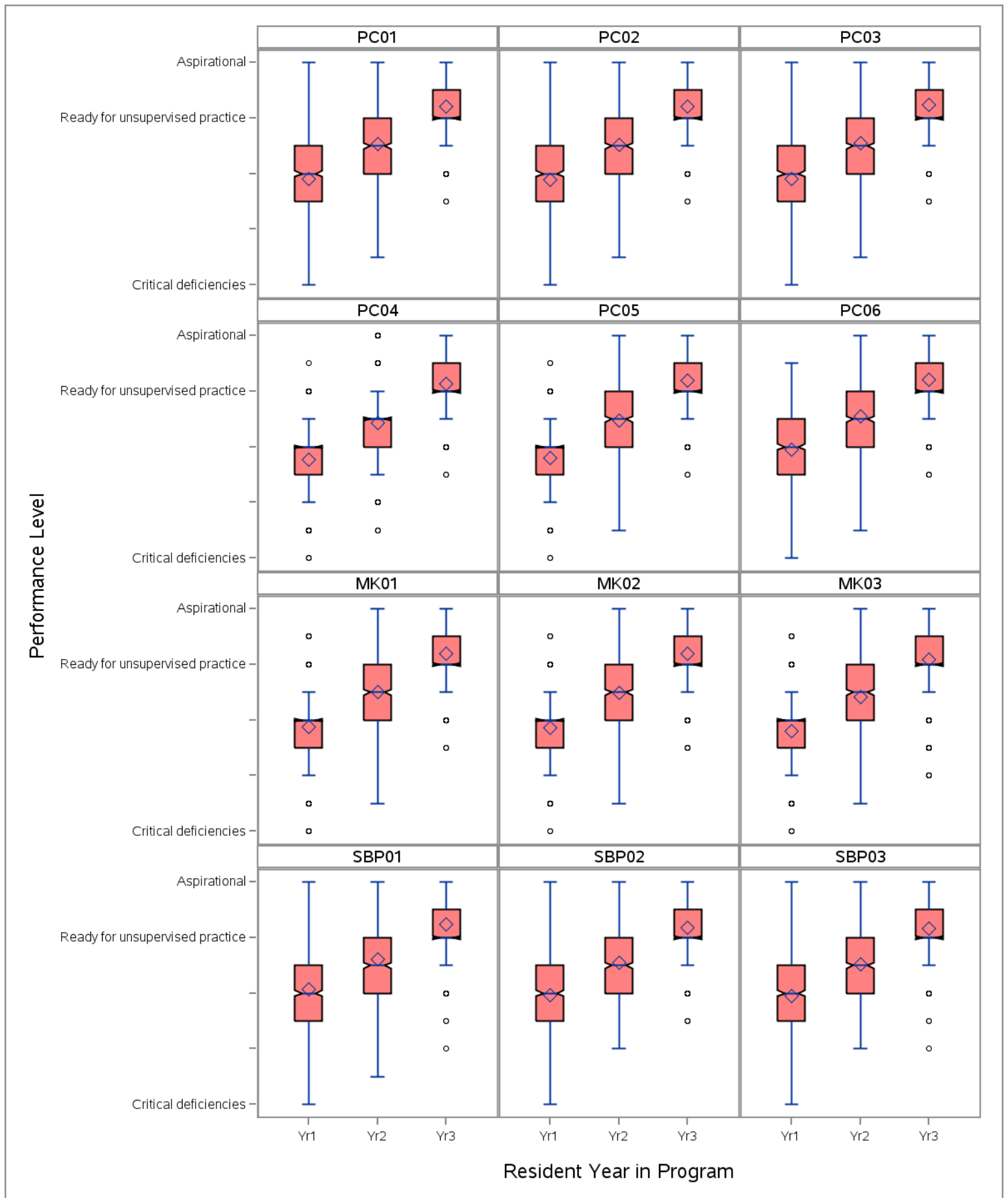


Table 28 - Cardiovascular disease (June 2017)



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Table 28 - Cardiovascular disease (June 2017)

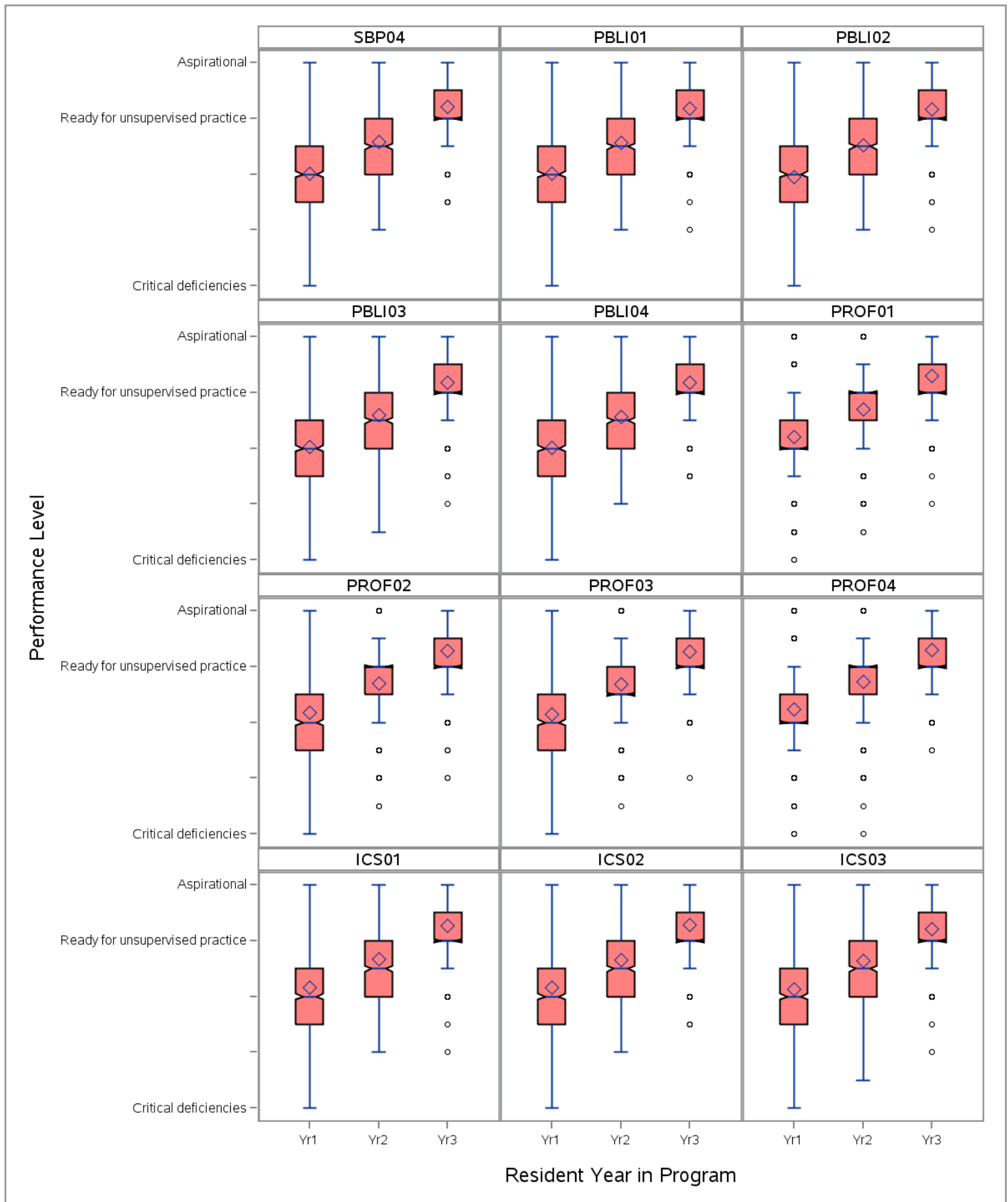
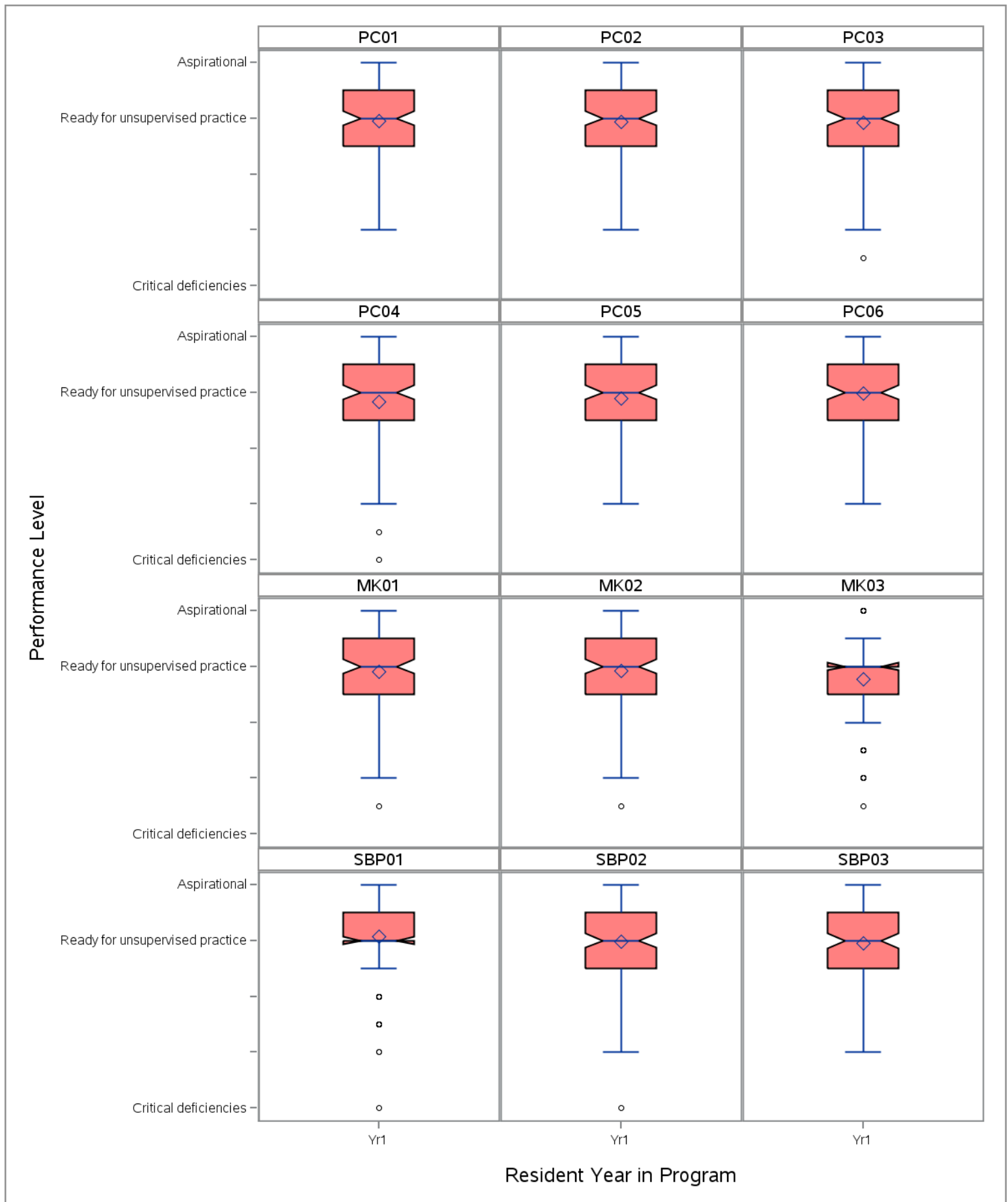


Table 29 - Clinical cardiac electrophysiology (June 2017)



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Table 29 - Clinical cardiac electrophysiology (June 2017)

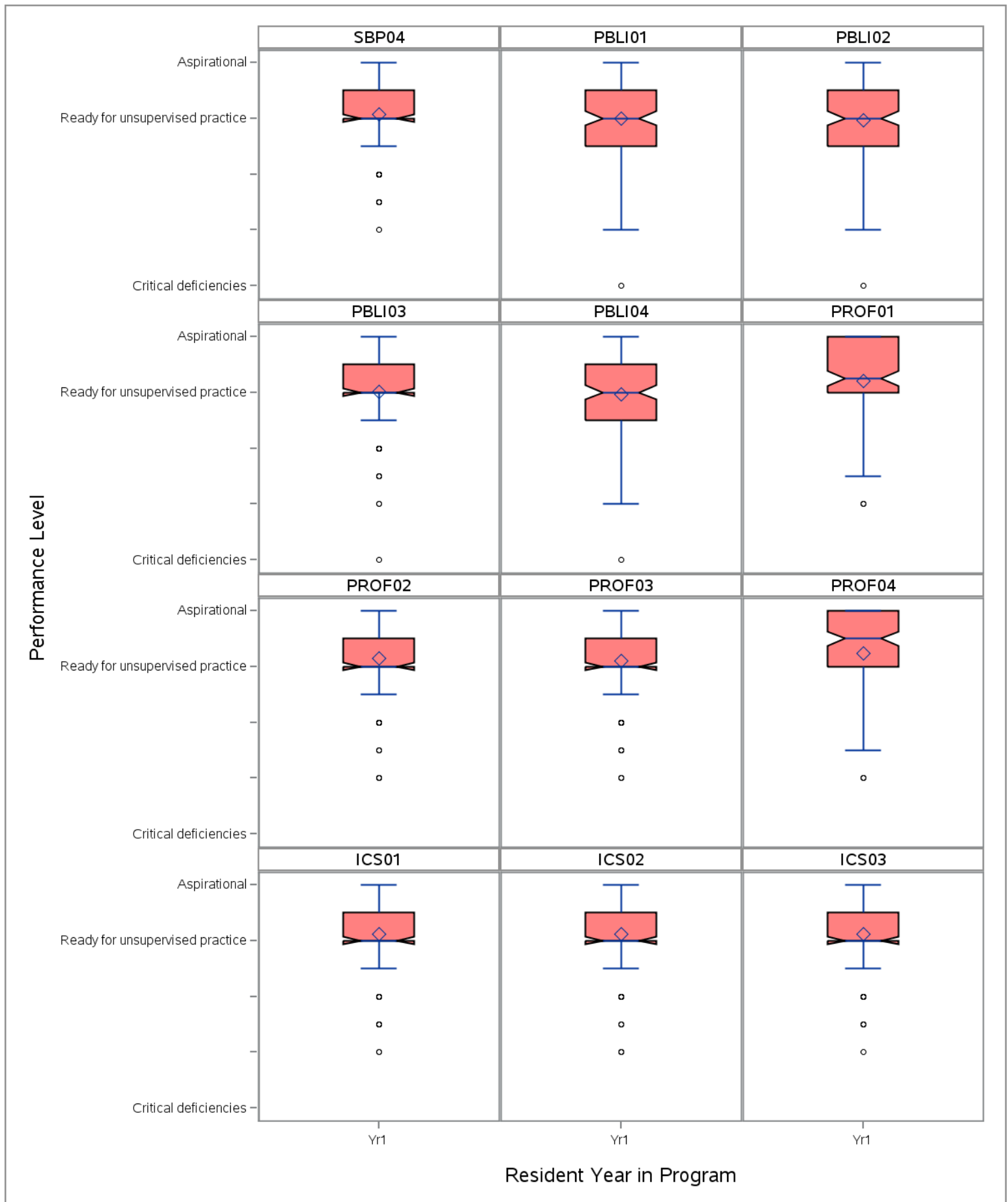
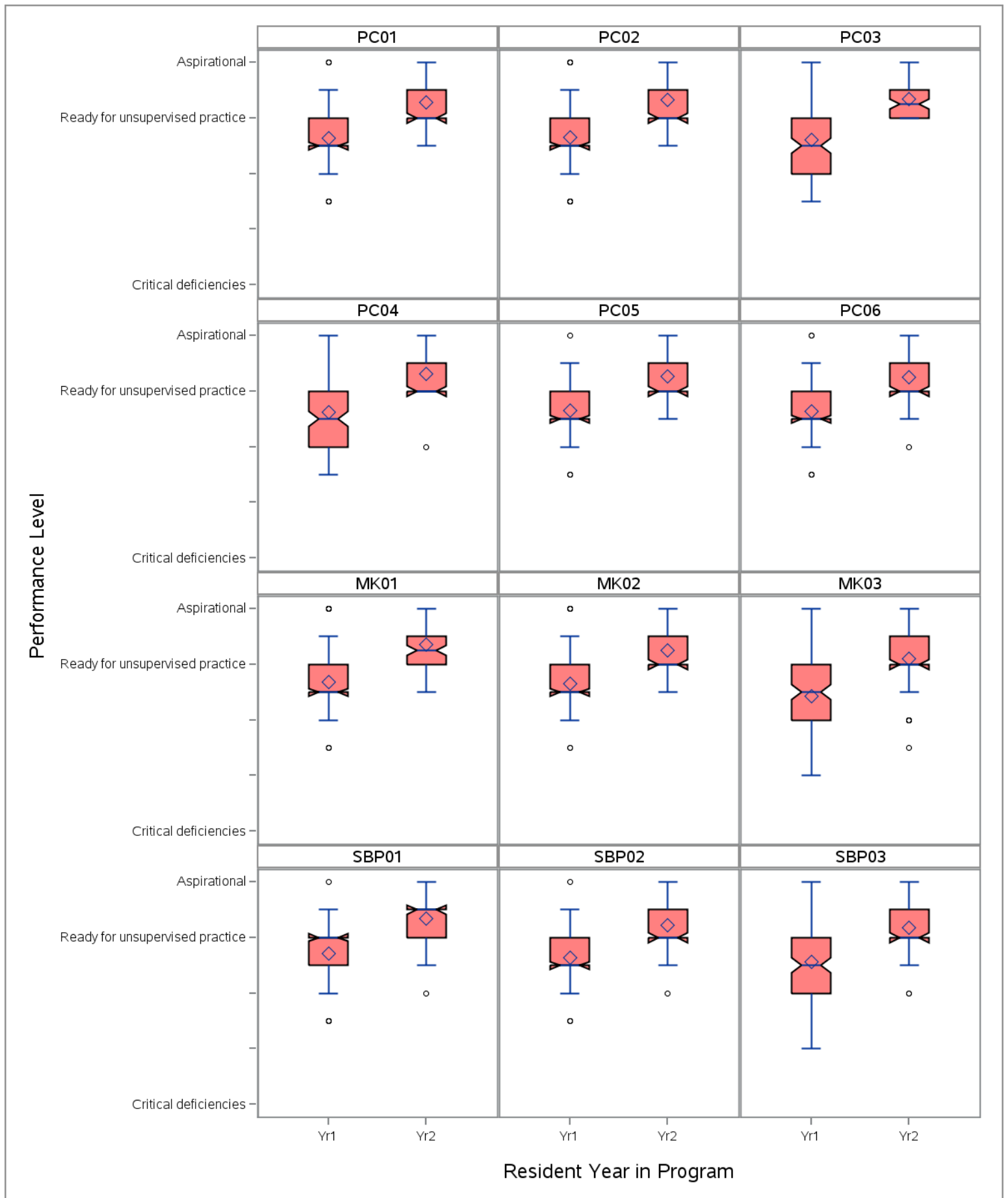
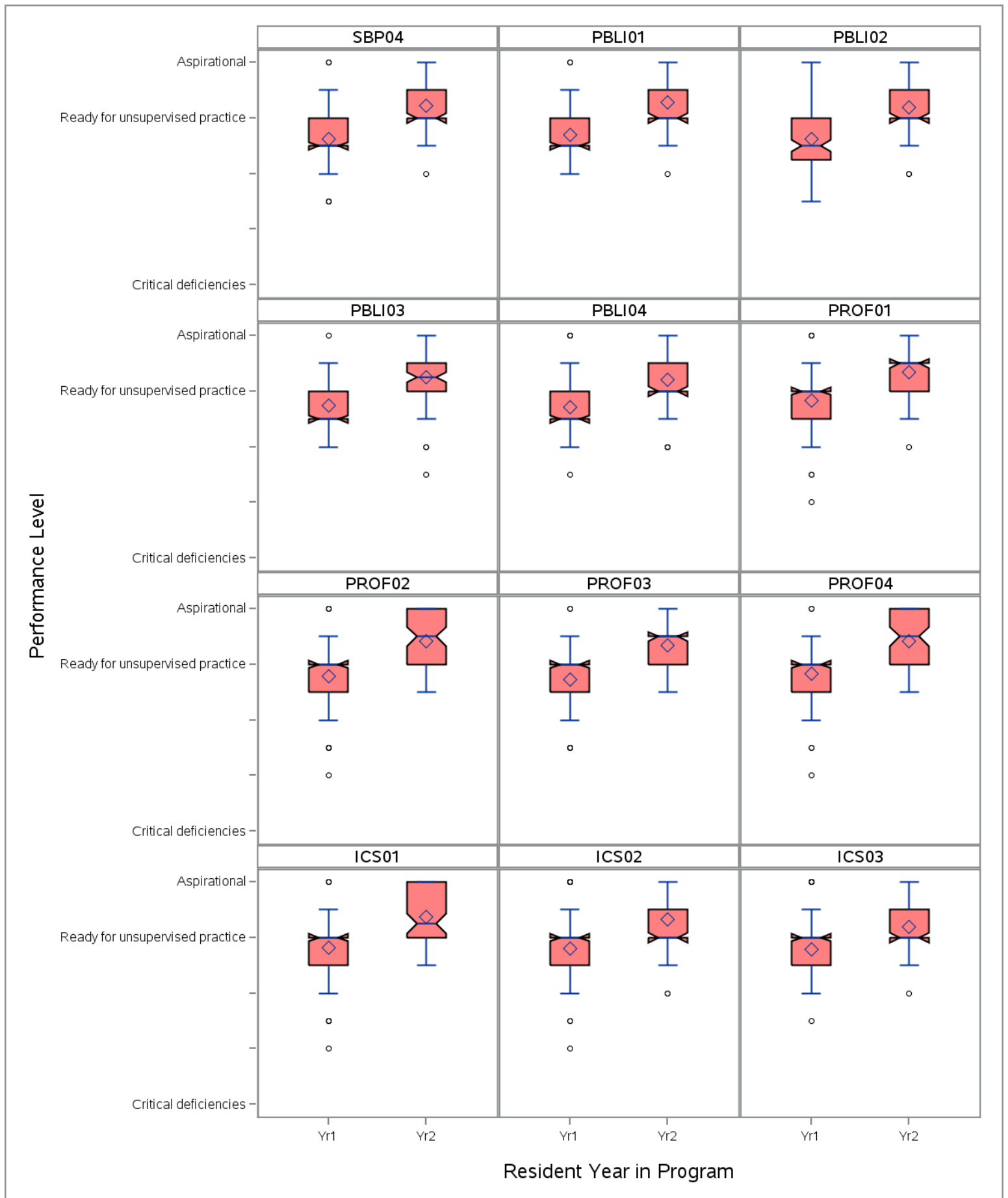


Table 30 - Critical care medicine (June 2017)



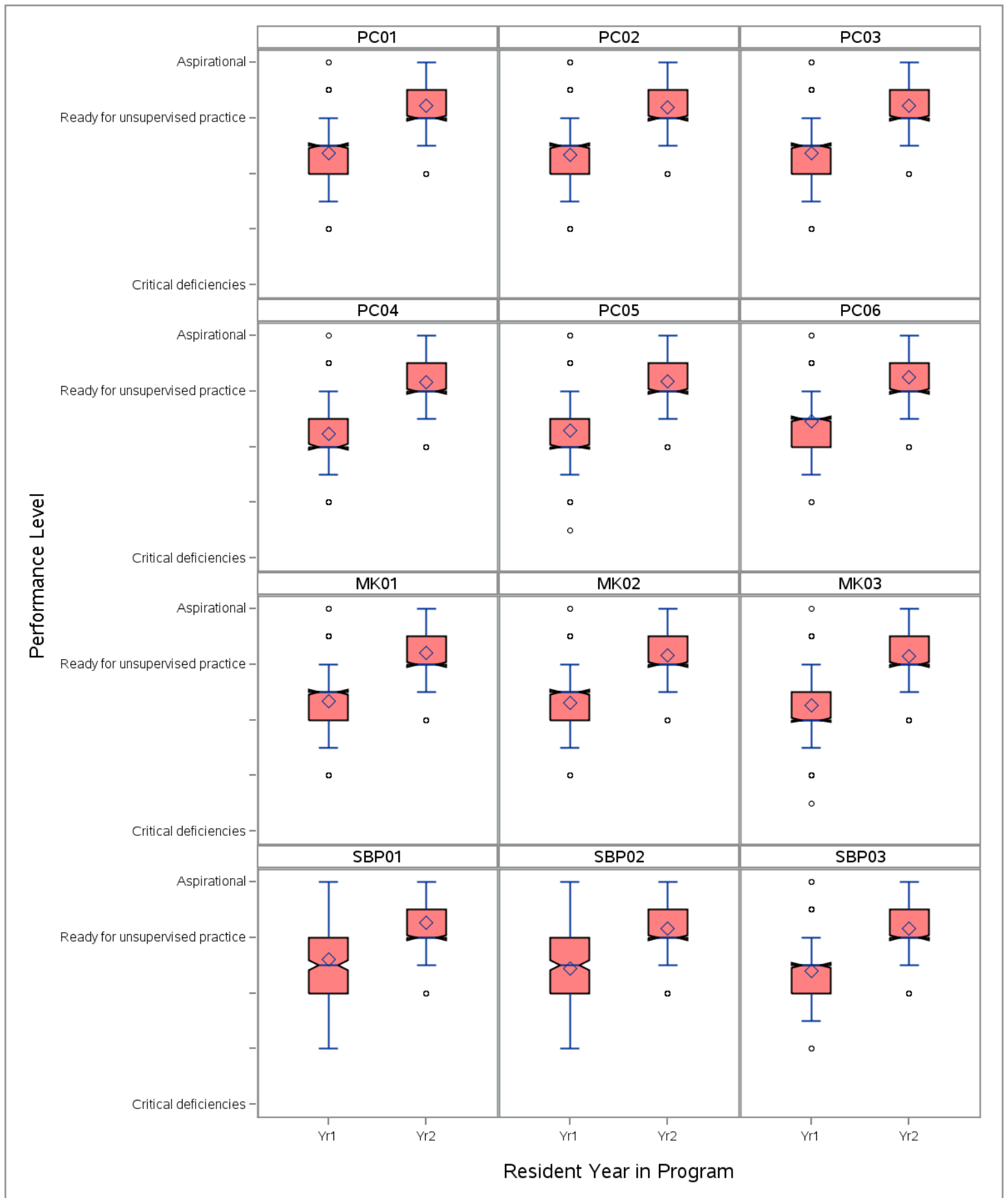
Continue to next page for Critical care medicine

Table 30 - Critical care medicine (June 2017)



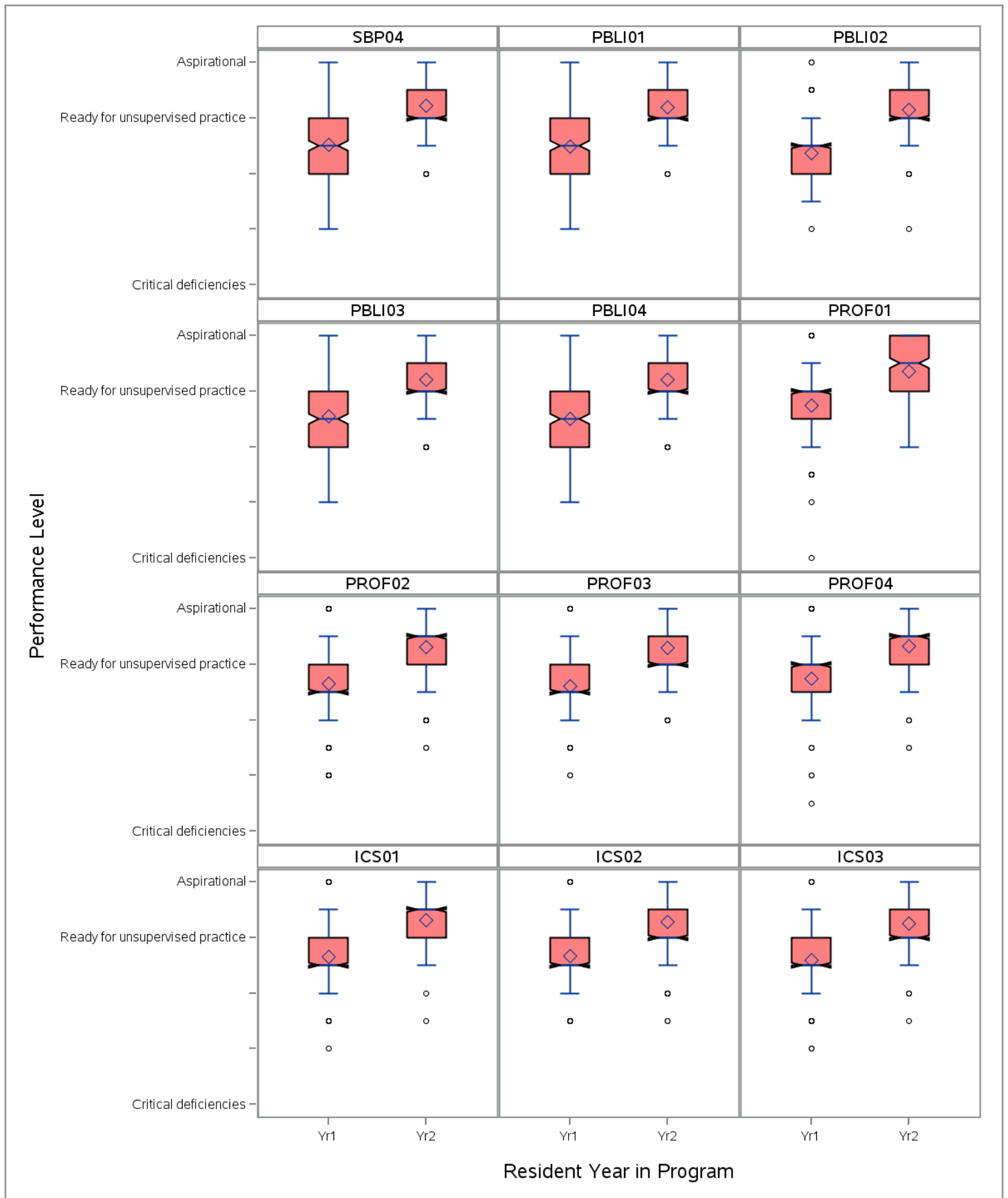
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Table 31 - Endocrinology, diabetes, and metabolism (June 2017)



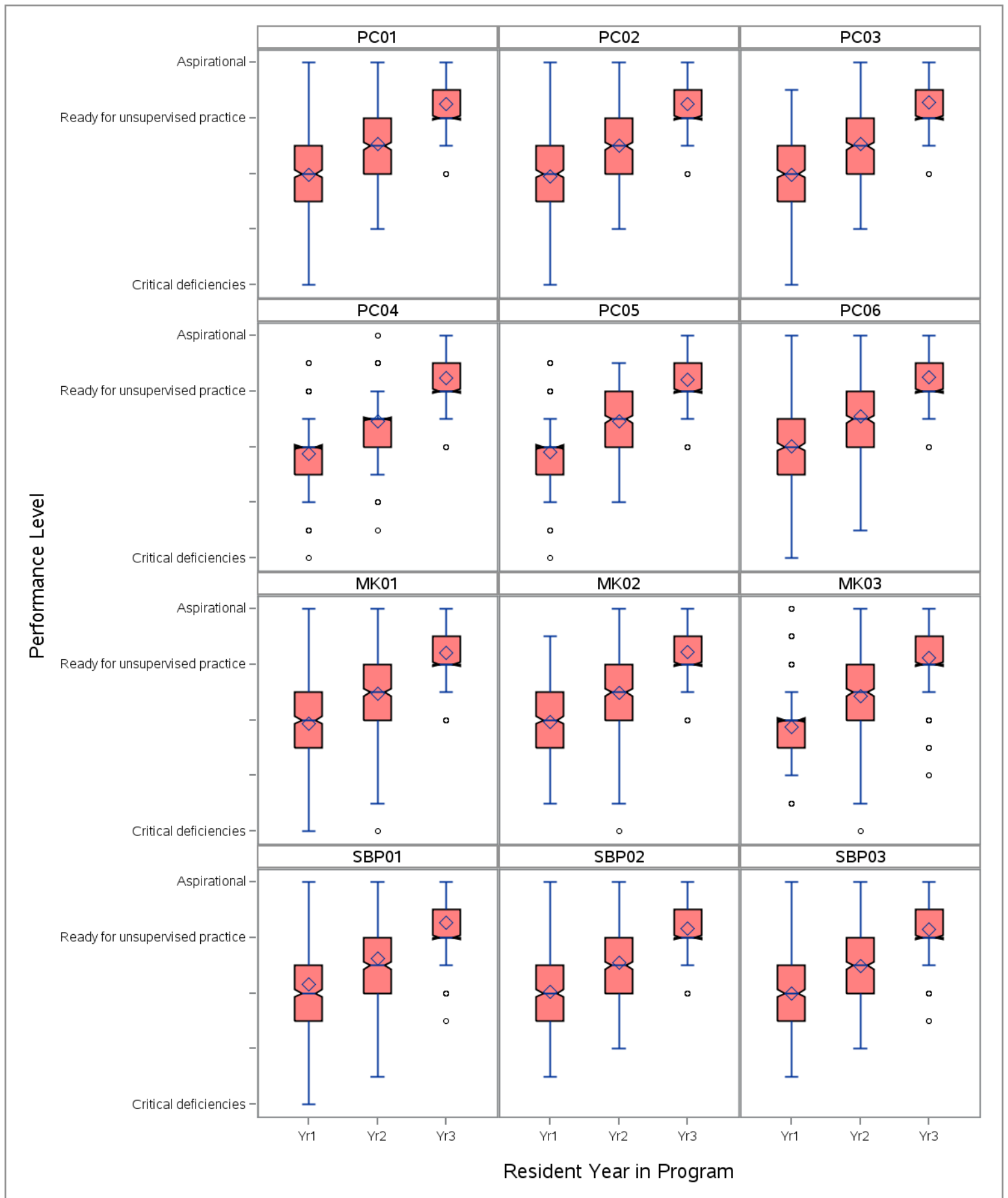
Continue to next page for Endocrinology, diabetes, and metabolism

Table 31 - Endocrinology, diabetes, and metabolism (June 2017)



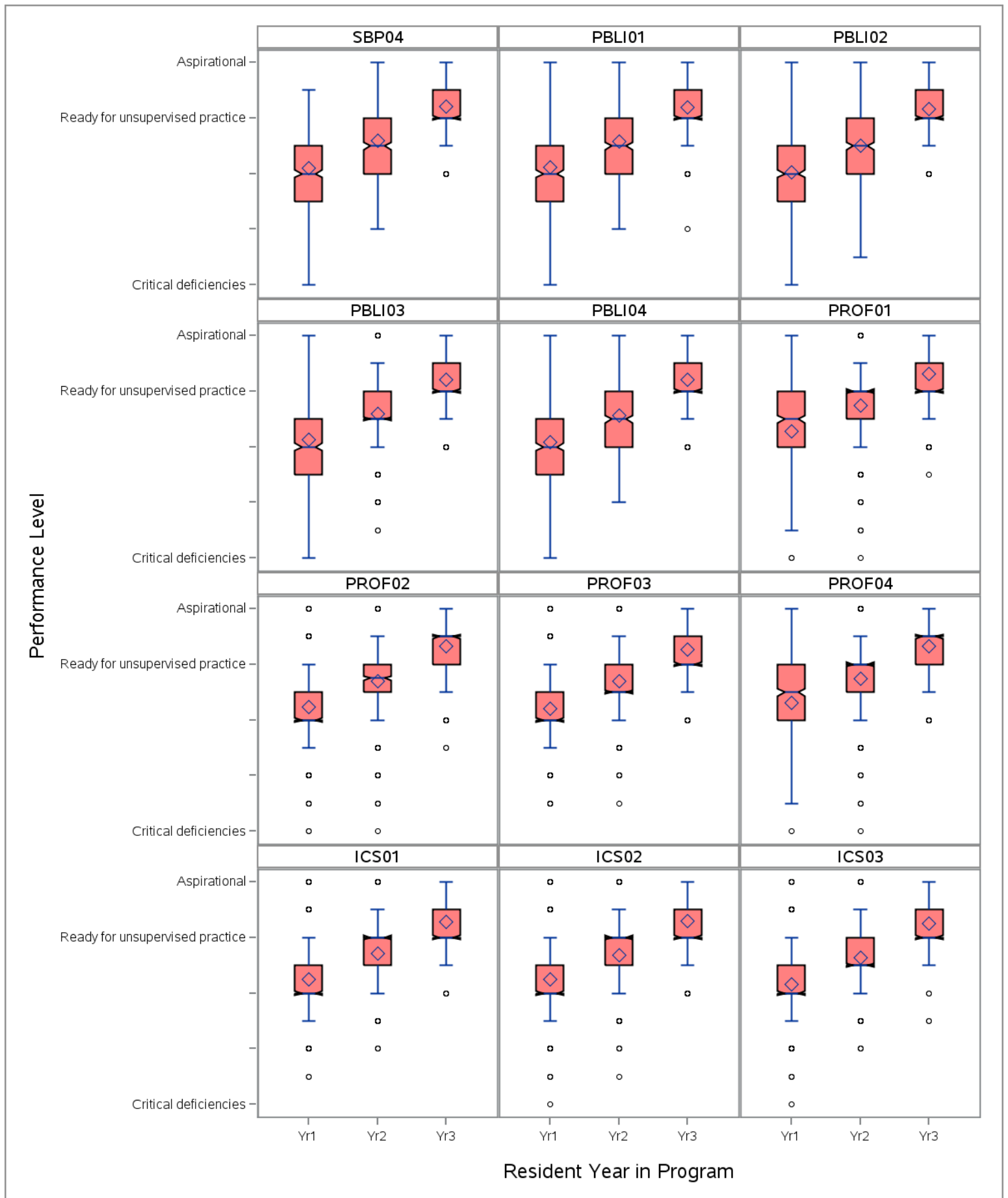
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Table 32 - Gastroenterology (June 2017)



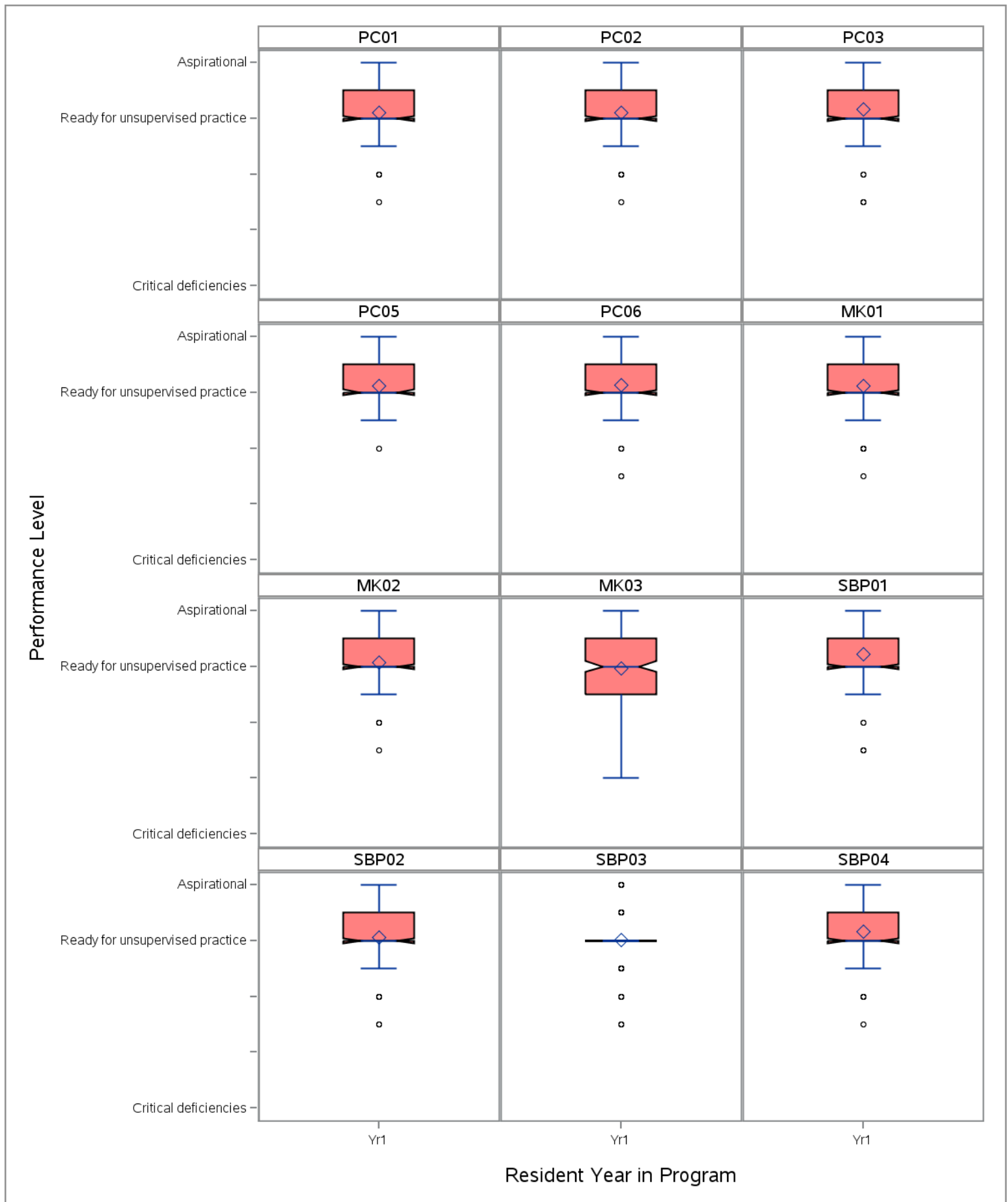
Continue to next page for Gastroenterology

Table 32 - Gastroenterology (June 2017)



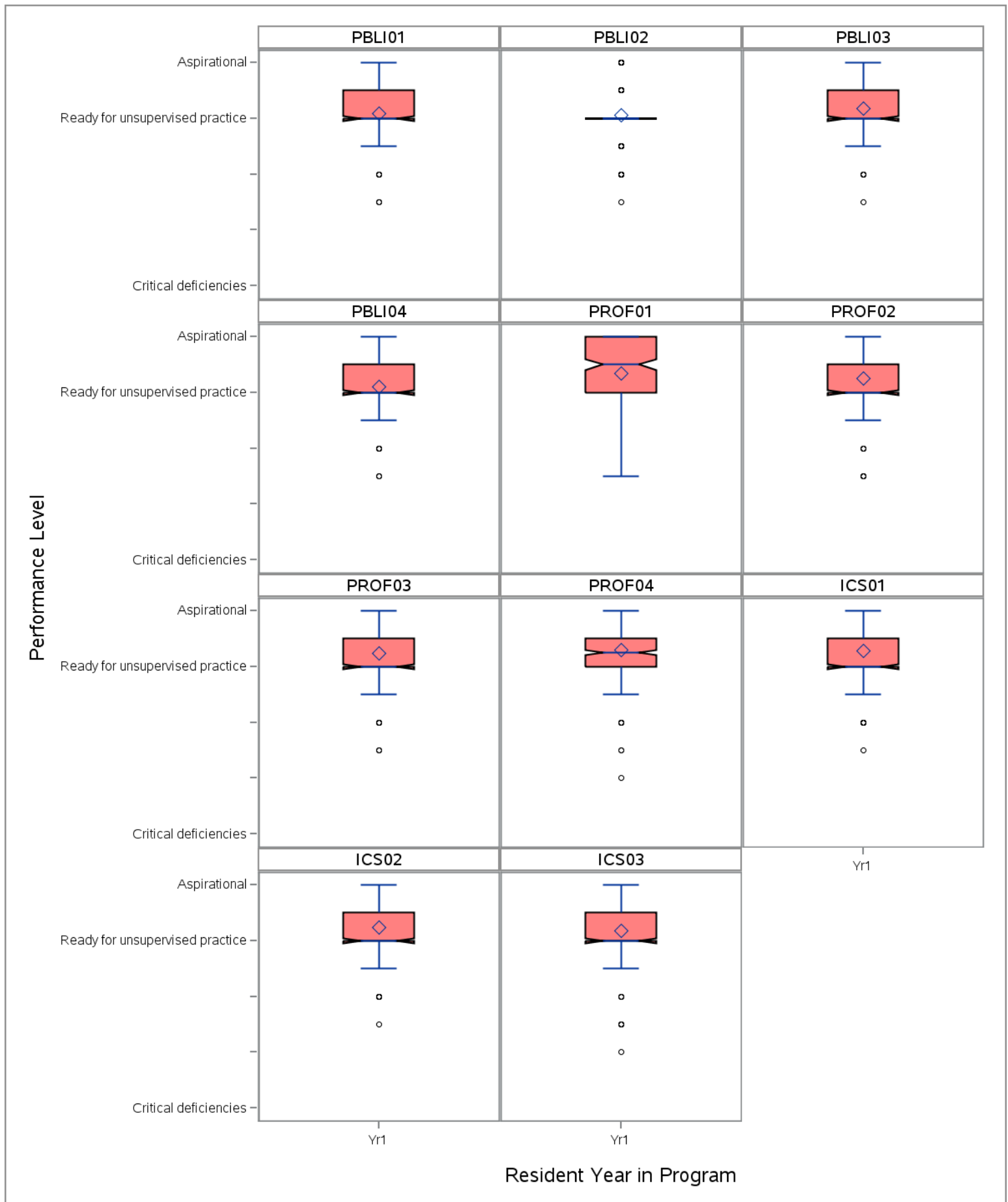
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Table 33 - Geriatric medicine (June 2017)



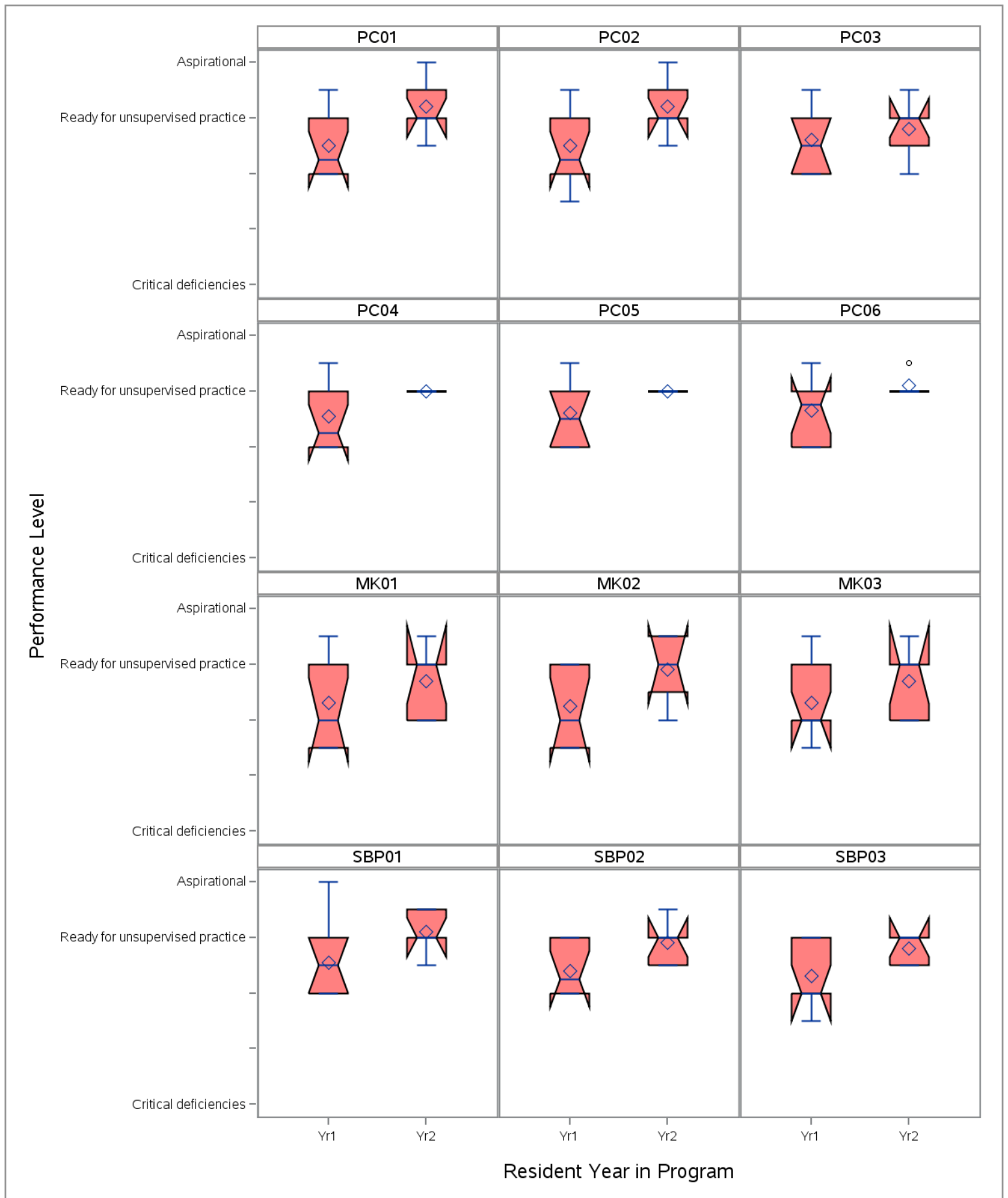
Continue to next page for Geriatric medicine

Table 33 - Geriatric medicine (June 2017)



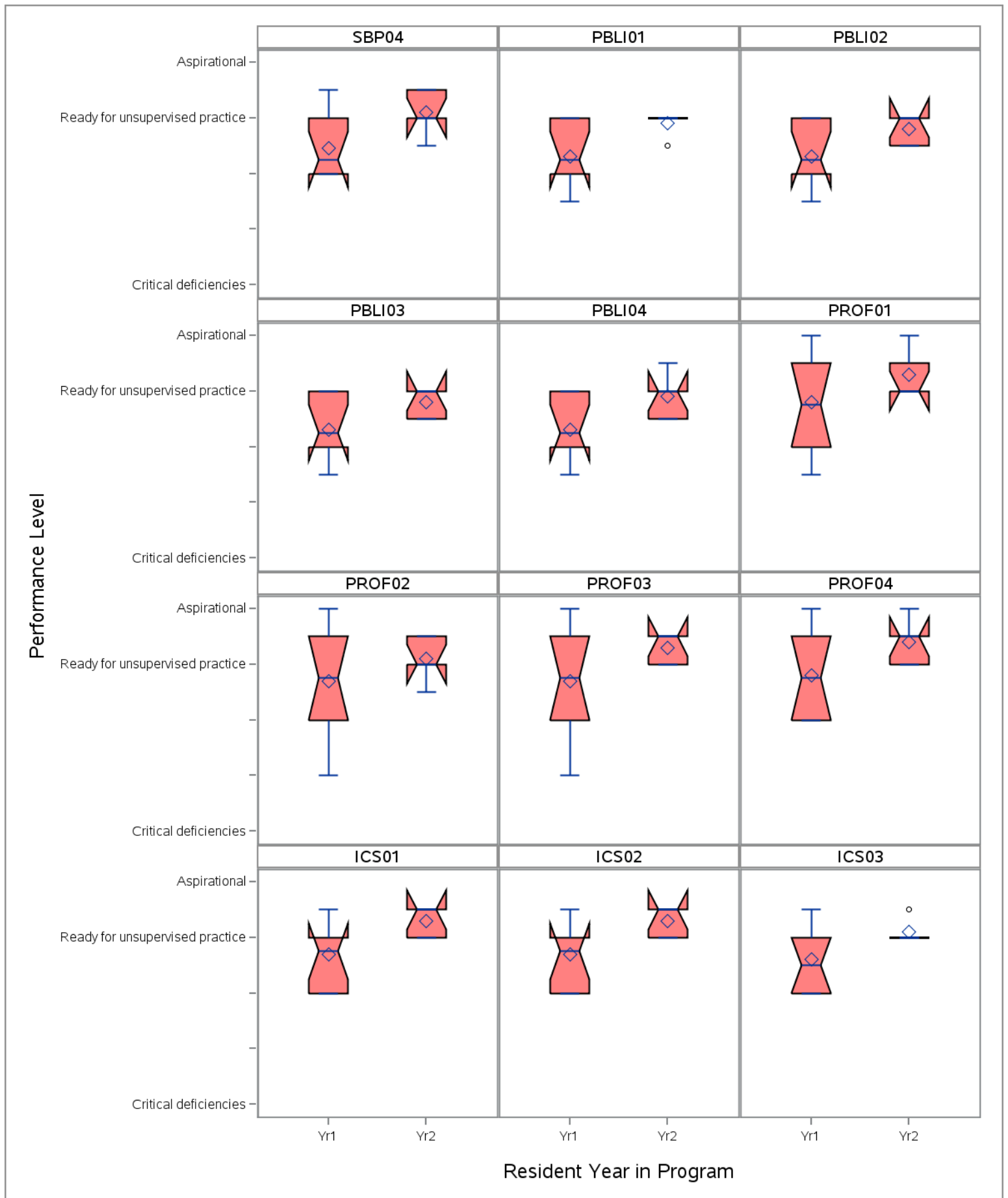
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Table 34 - Hematology (June 2017)



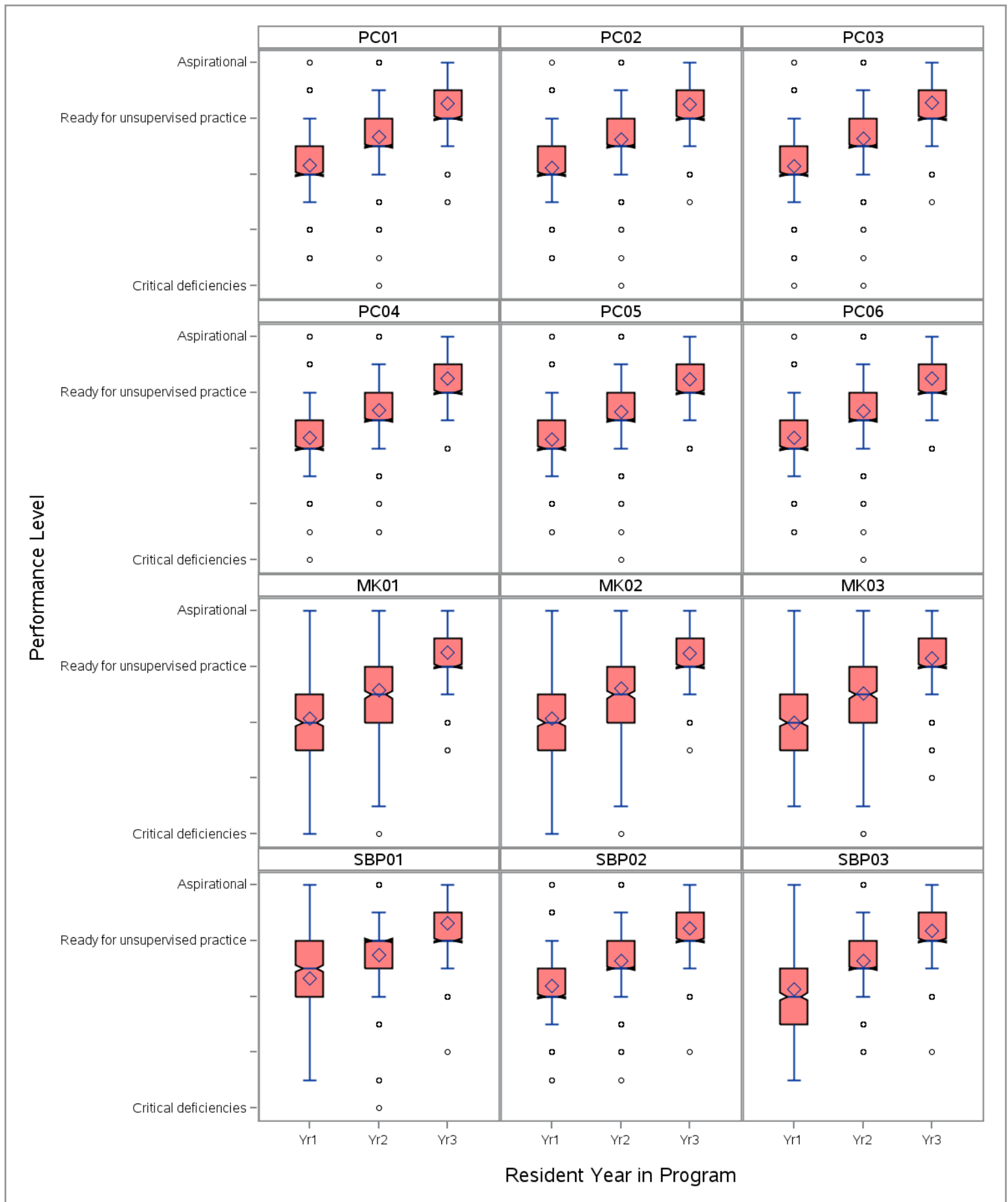
Continue to next page for Hematology

Table 34 - Hematology (June 2017)



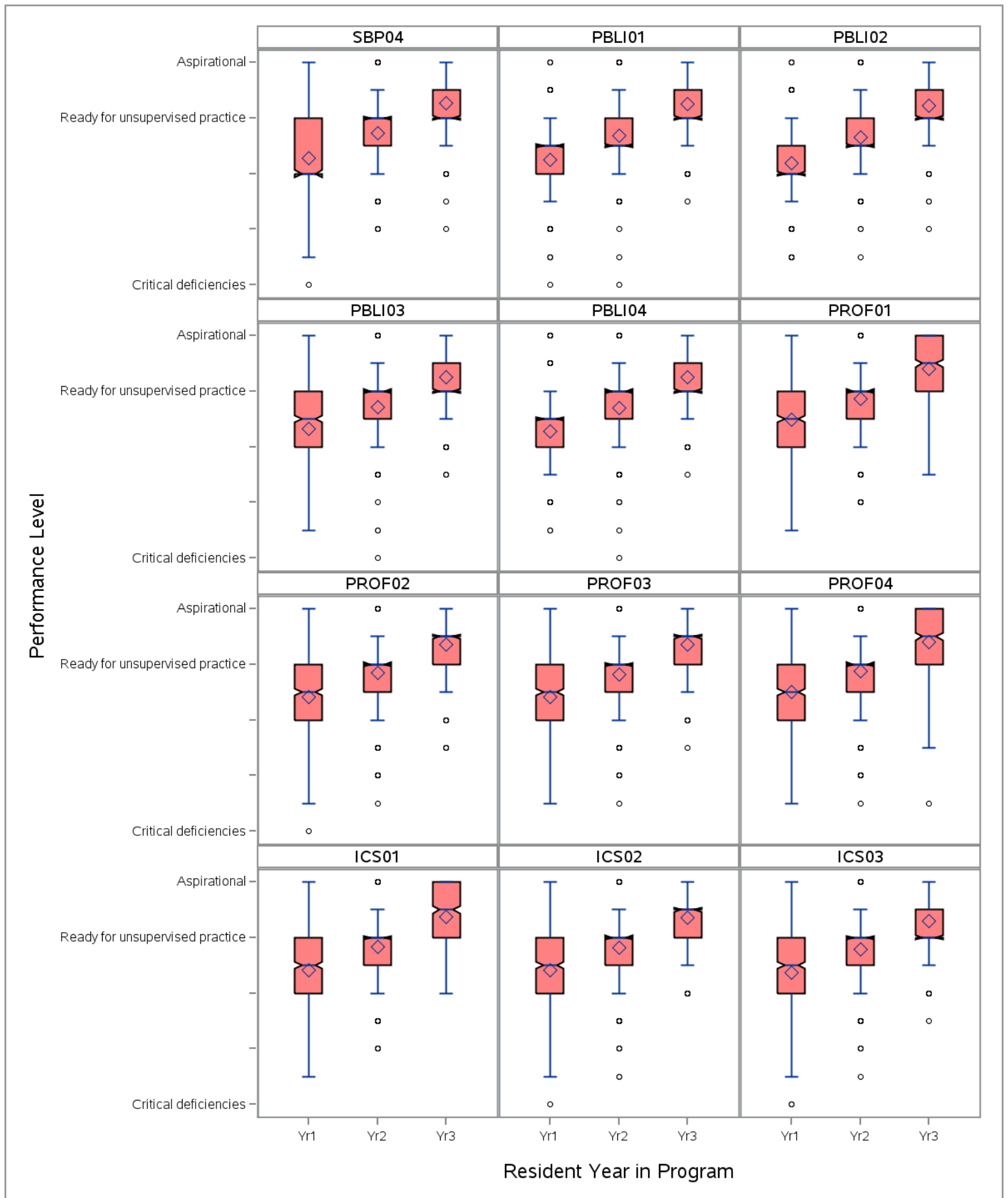
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Table 35 - Hematology and medical oncology (June 2017)



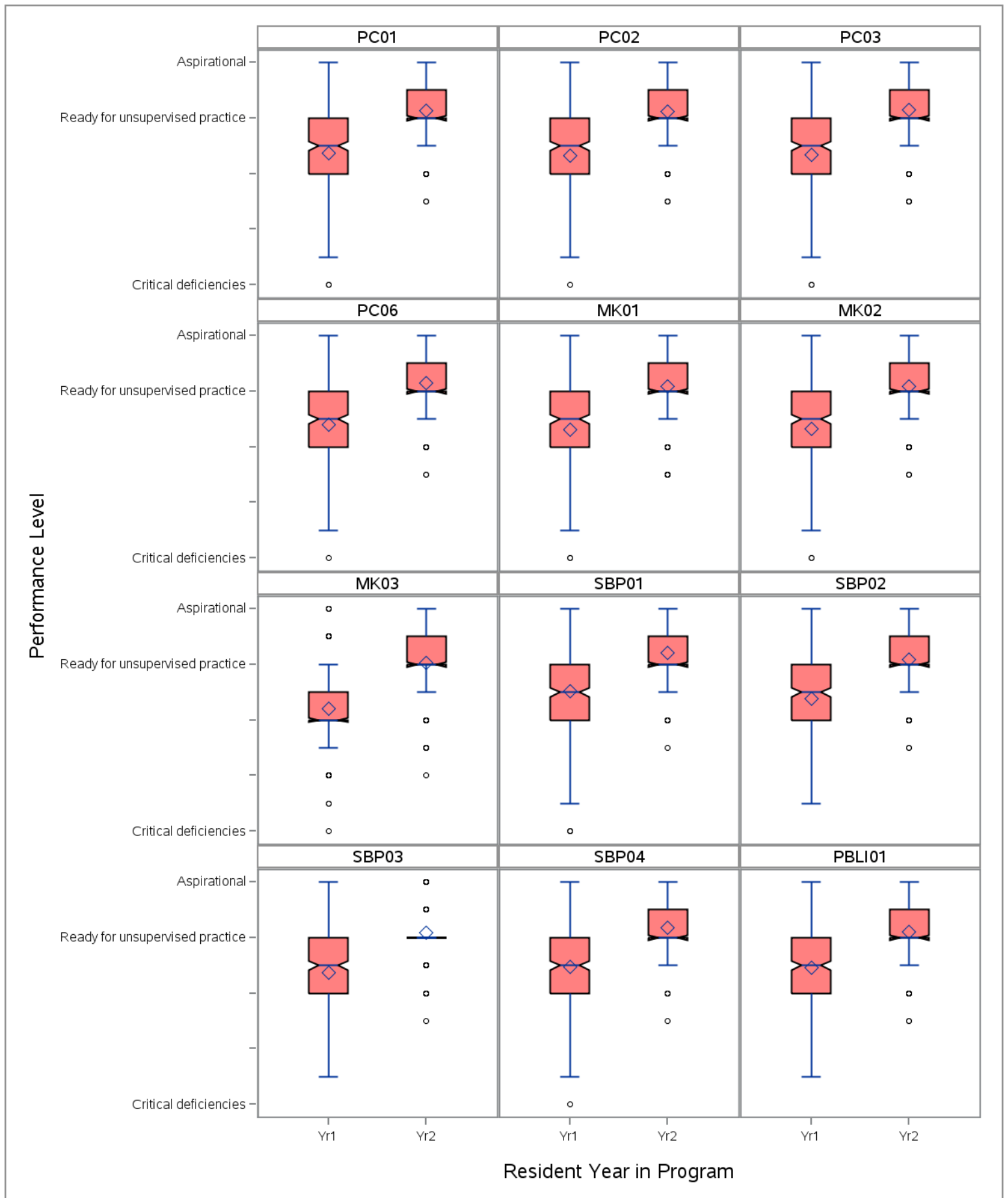
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Table 35 - Hematology and medical oncology (June 2017)



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Table 36 - Infectious disease (June 2017)



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Table 36 - Infectious disease (June 2017)

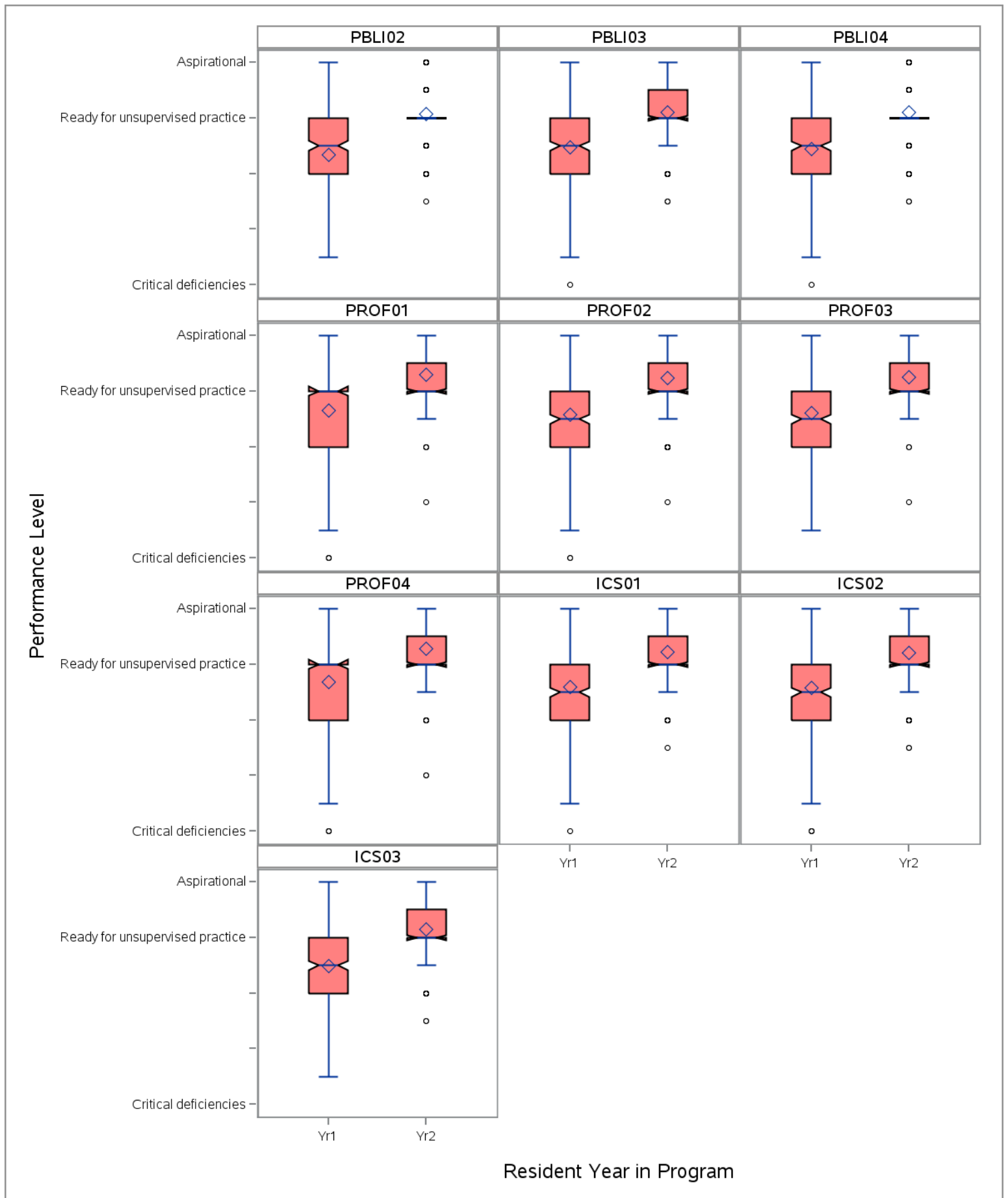
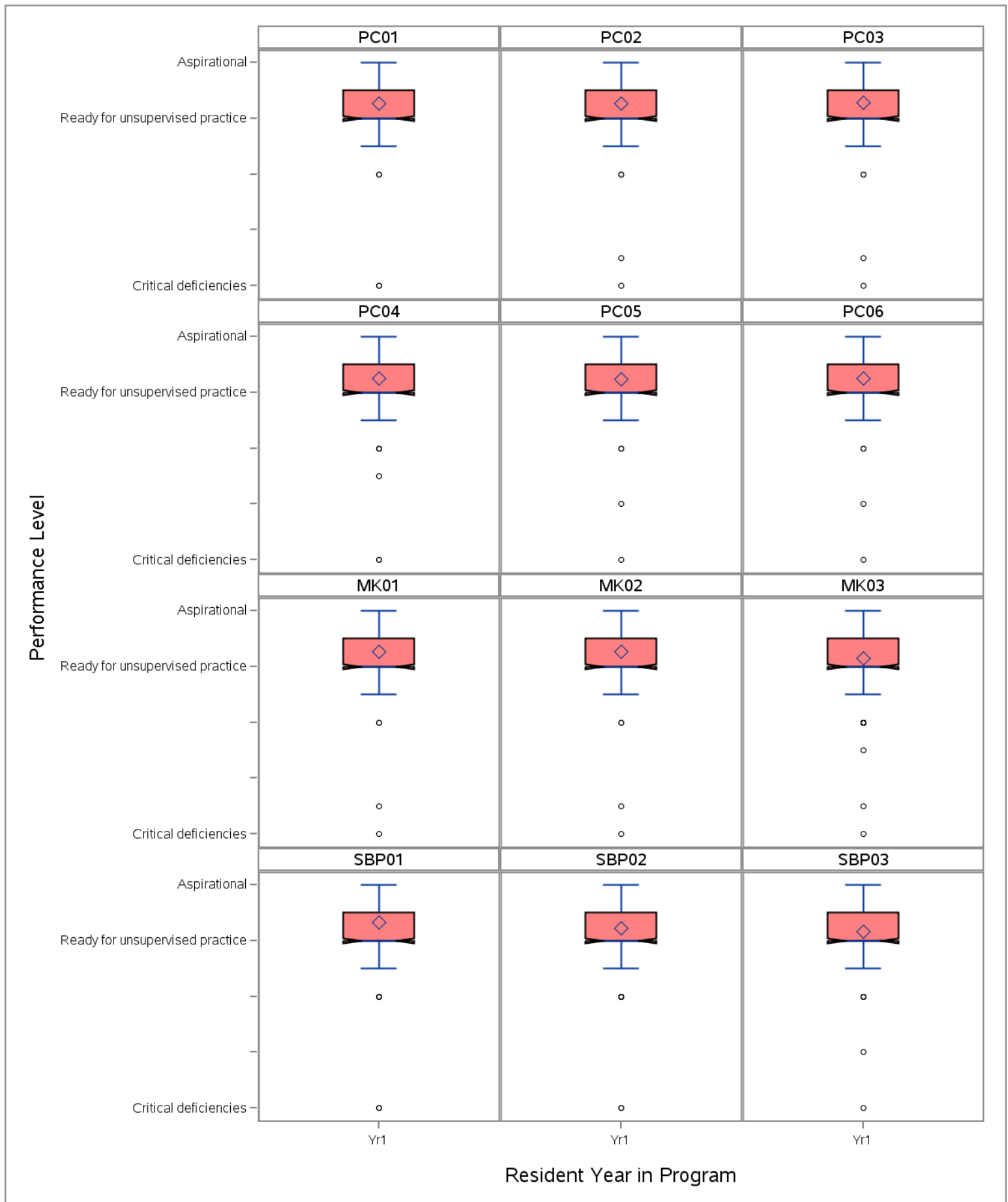
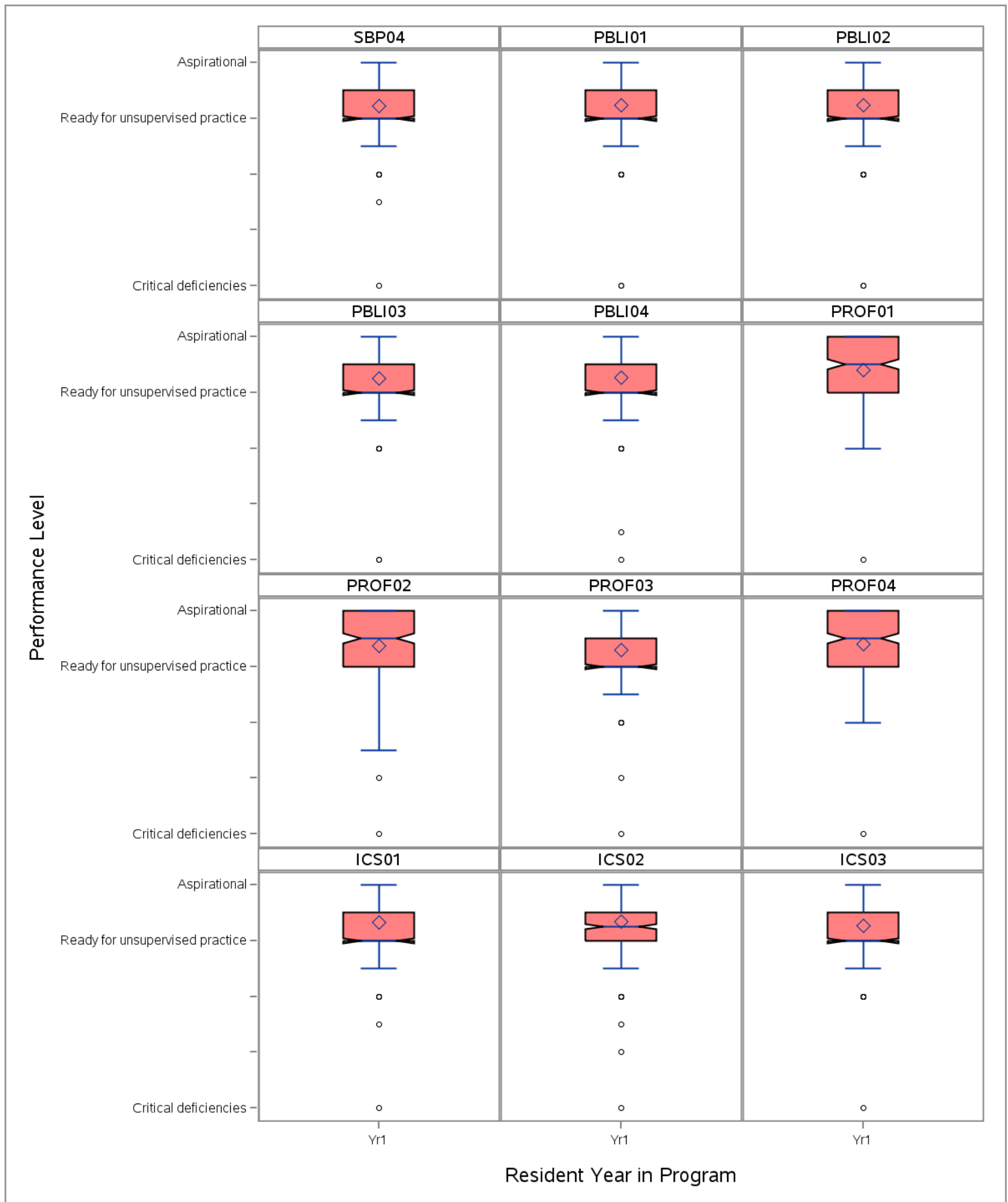


Table 37 - Interventional cardiology (June 2017)



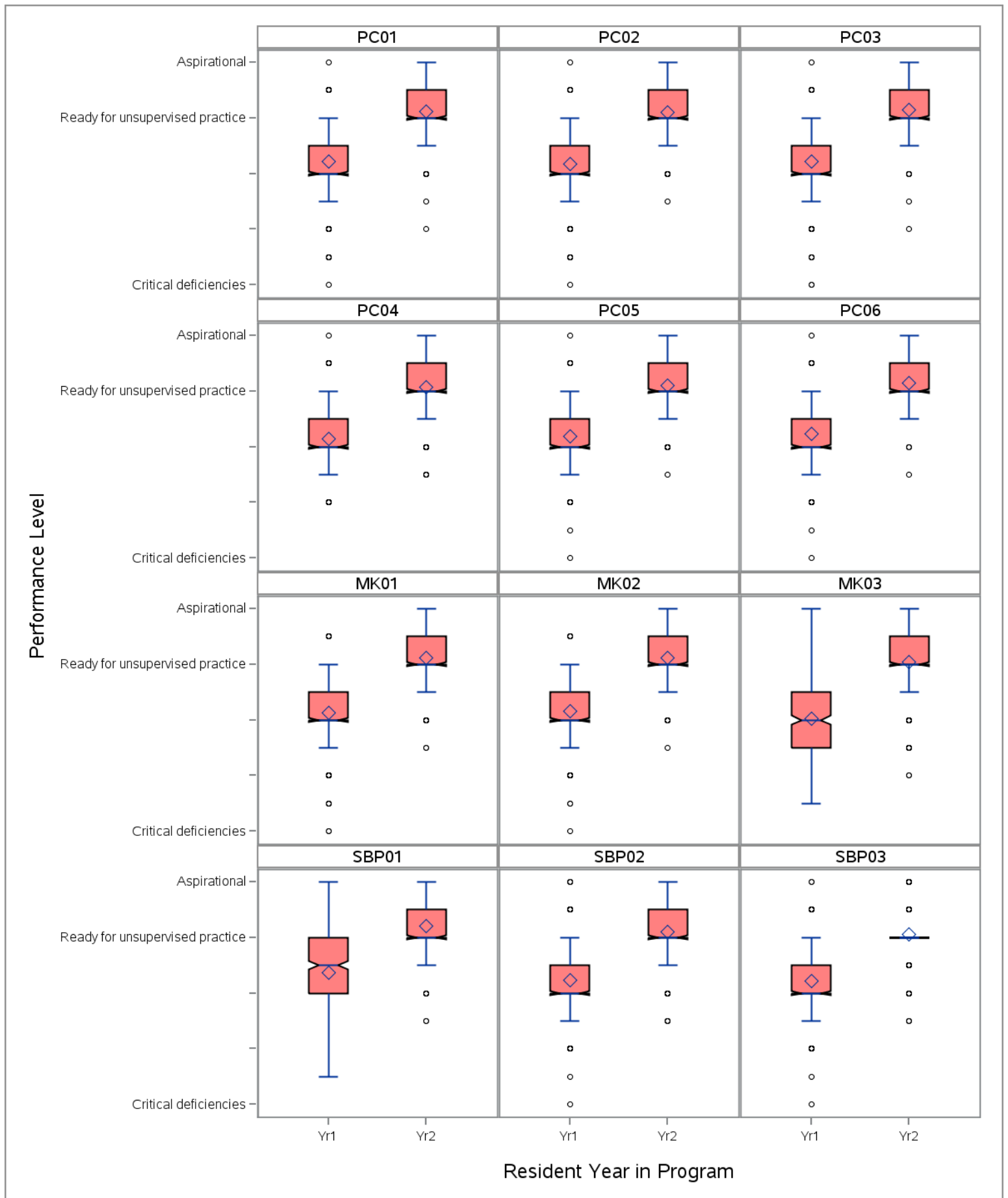
Continue to next page for Interventional cardiology

Table 37 - Interventional cardiology (June 2017)



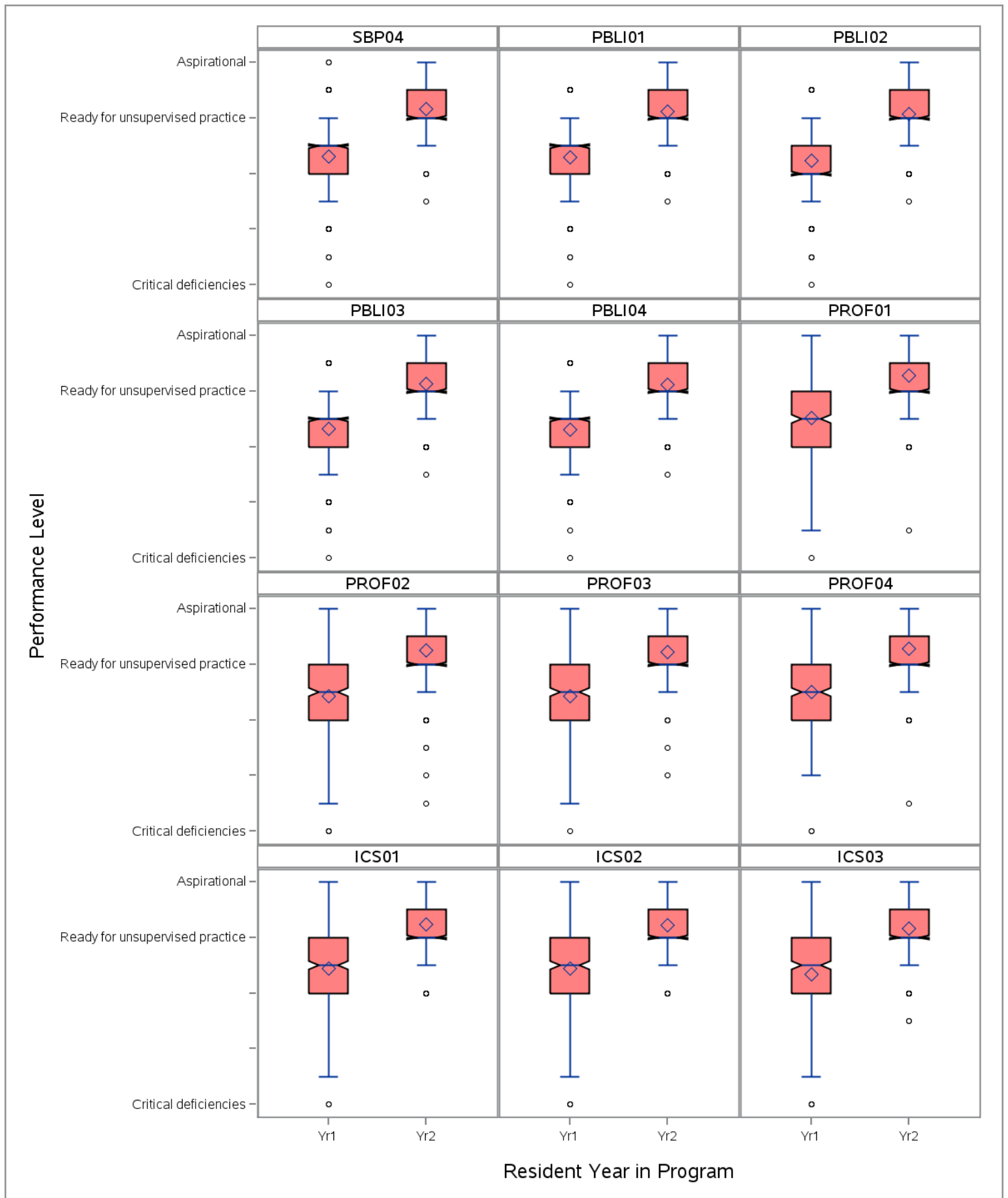
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Table 38 - Nephrology (June 2017)



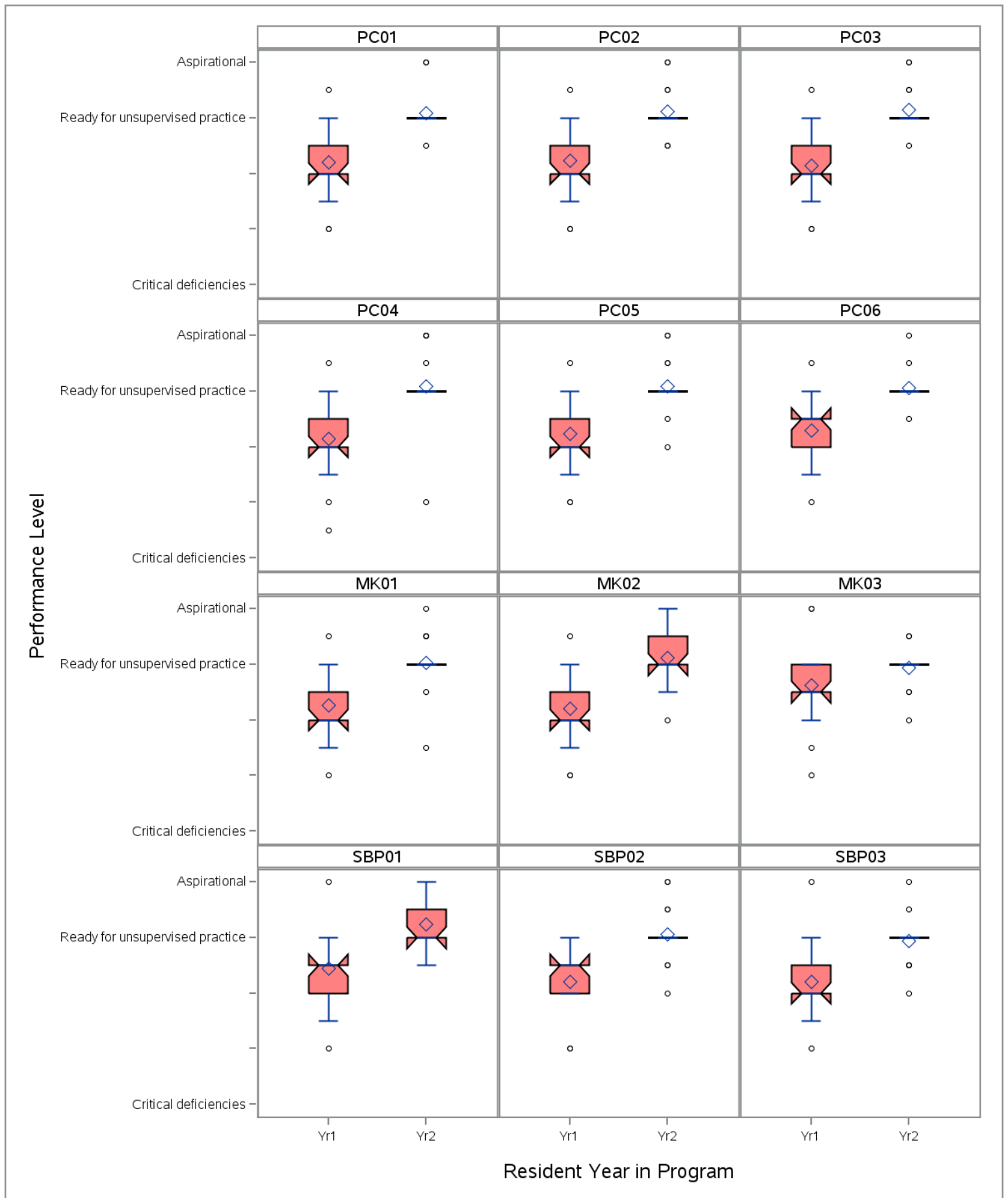
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Table 38 - Nephrology (June 2017)



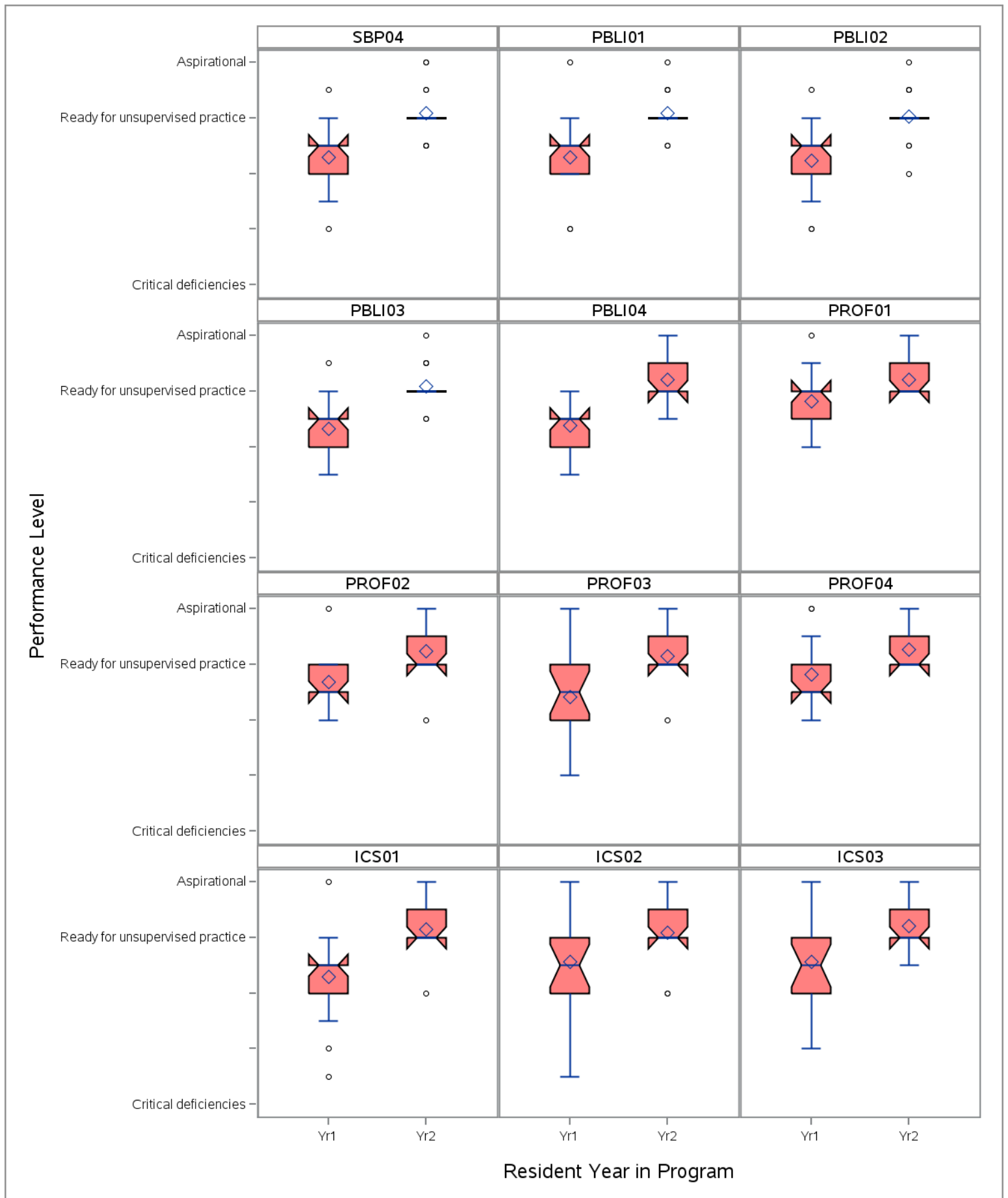
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Table 39 - Medical oncology (June 2017)



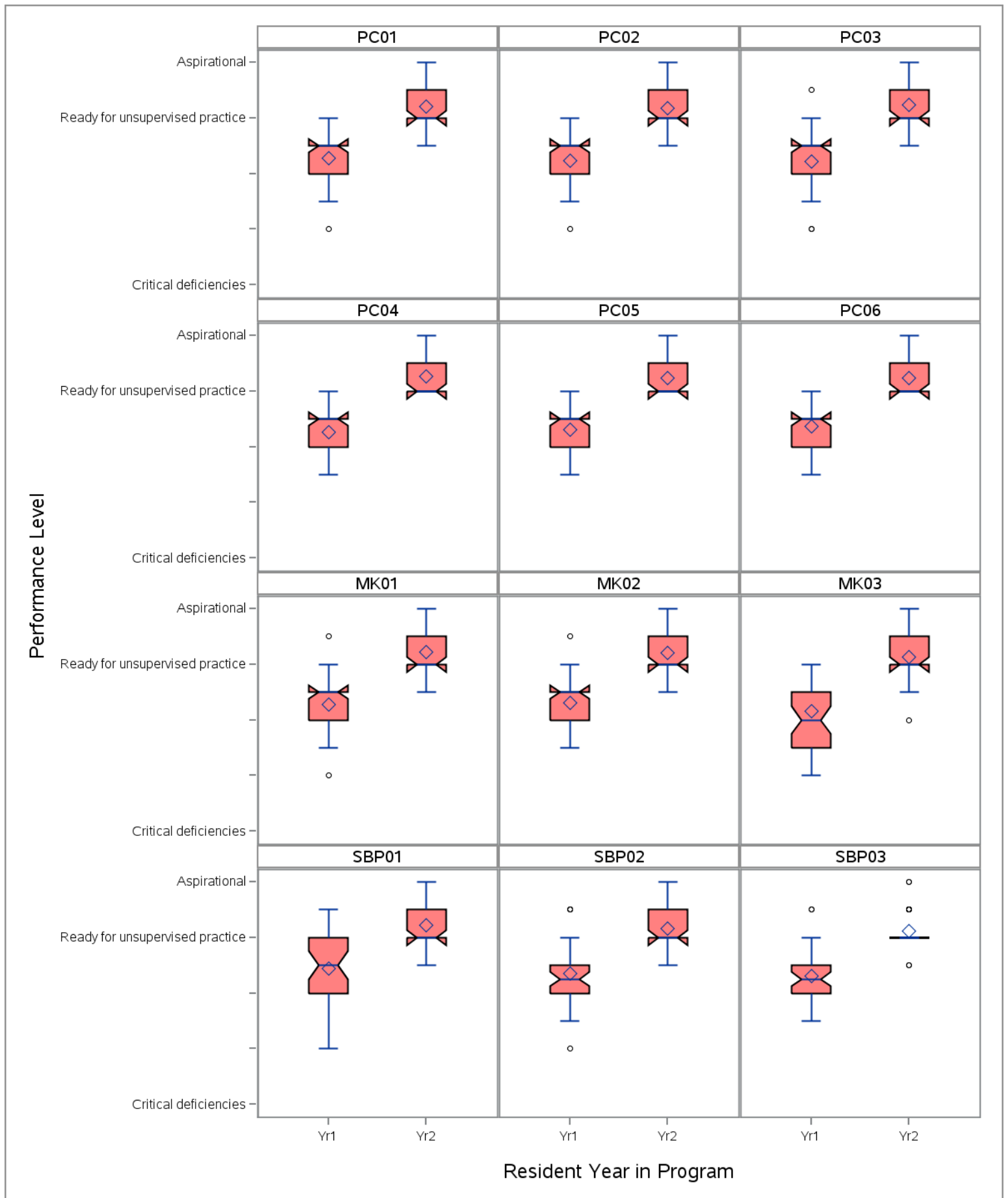
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Table 39 - Medical oncology (June 2017)



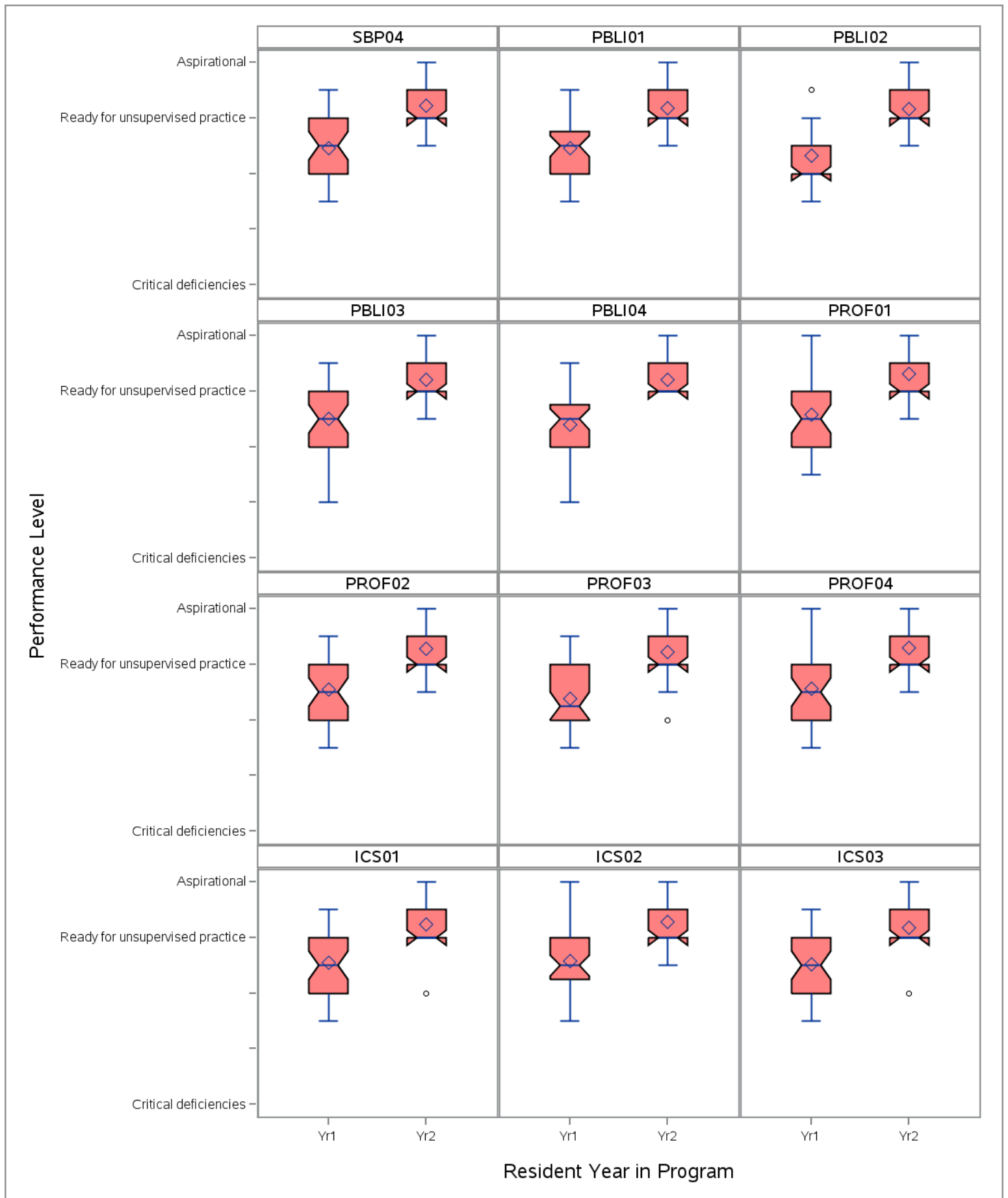
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Table 40 - Pulmonary disease (June 2017)



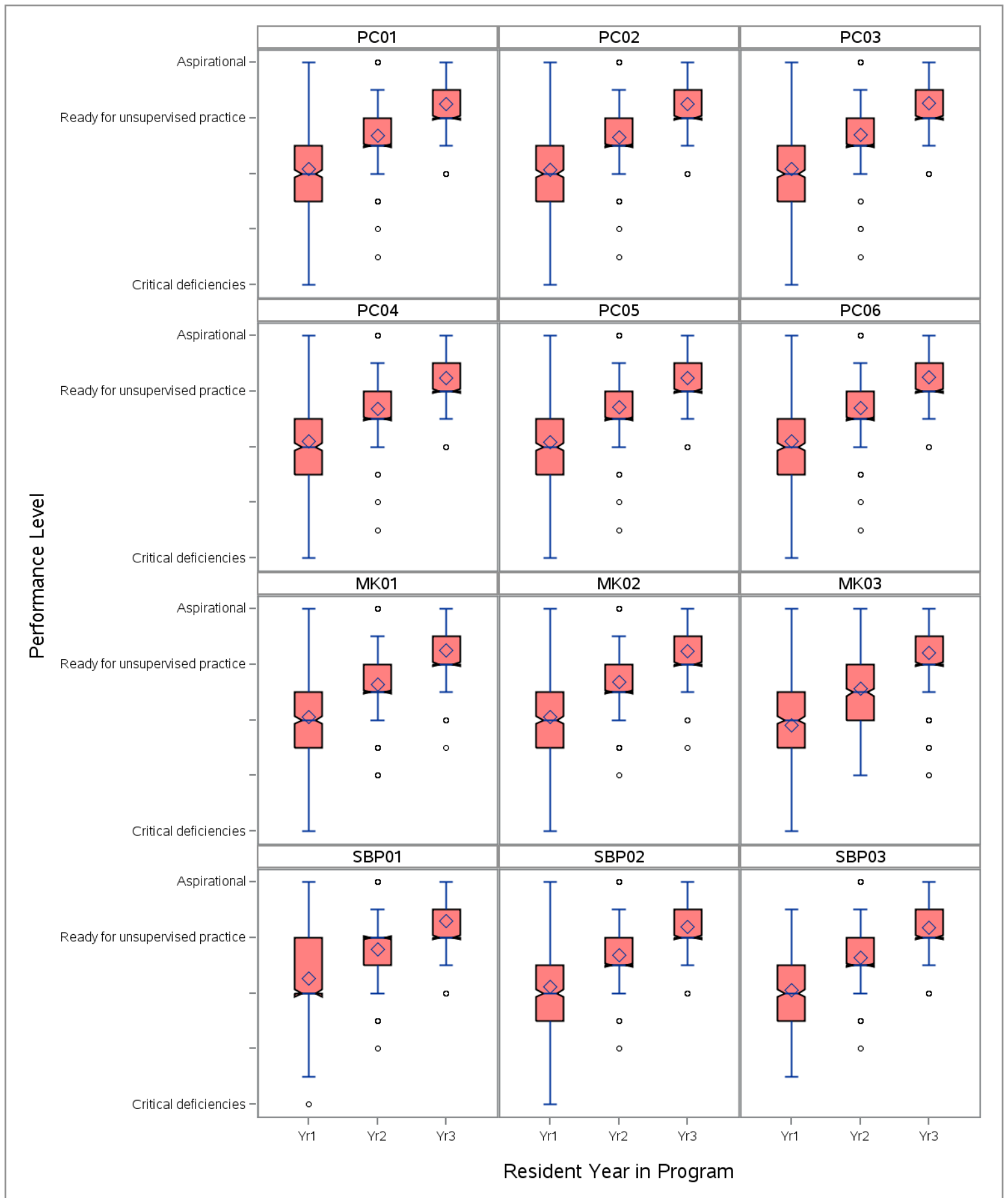
Continue to next page for Pulmonary disease

Table 40 - Pulmonary disease (June 2017)



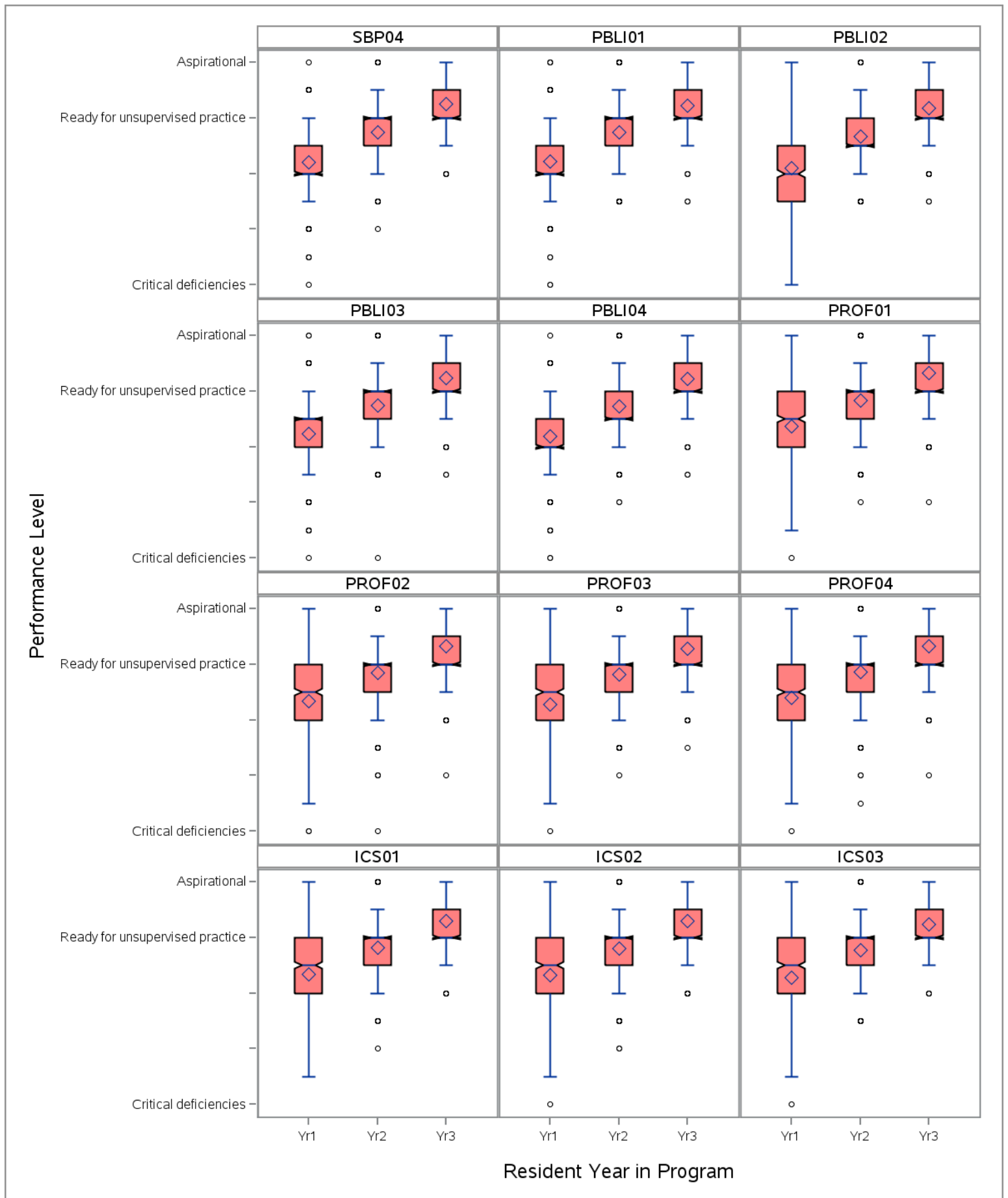
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Table 41 - Pulmonary disease and critical care medicine (June 2017)



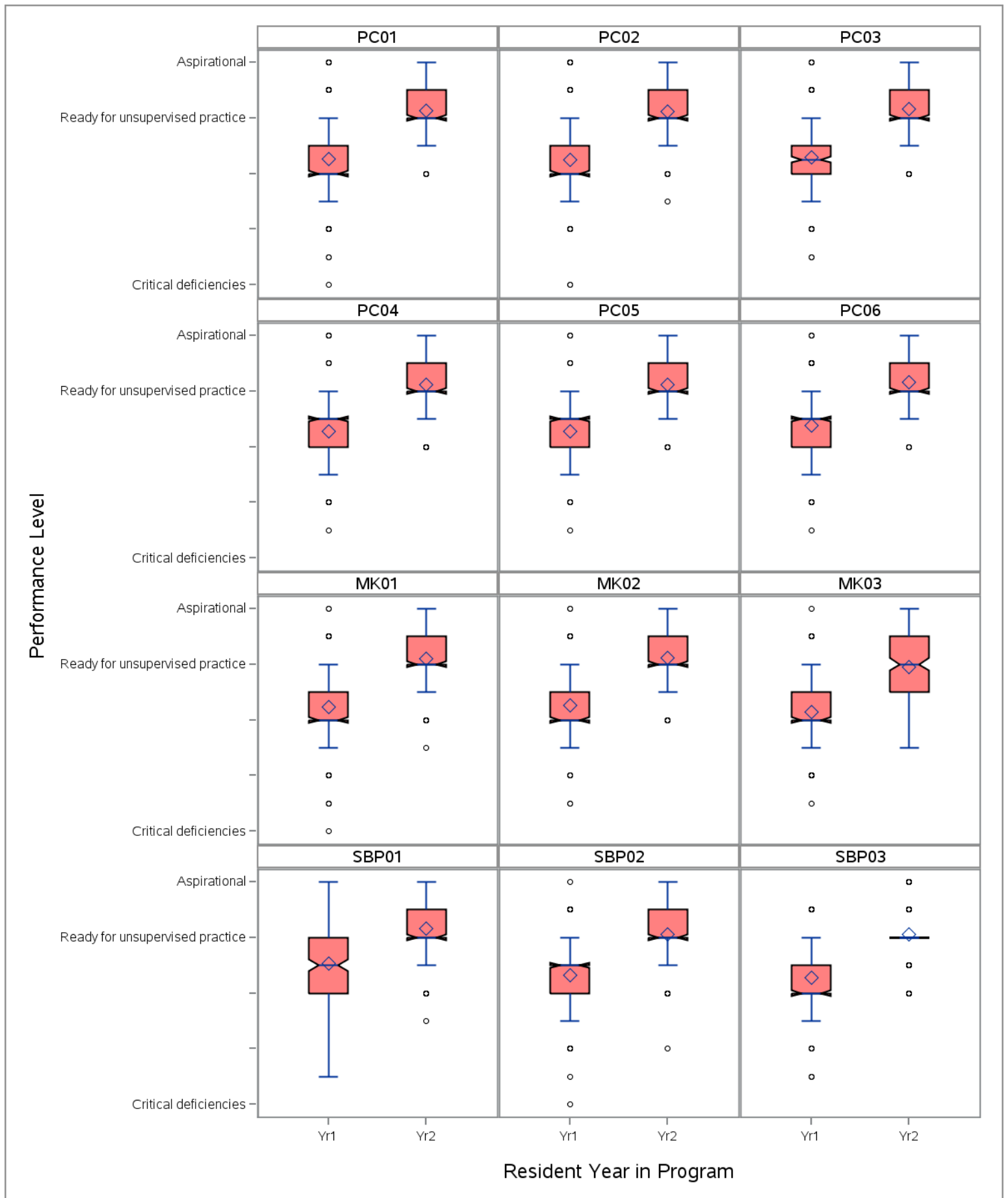
Continue to next page for Pulmonary disease and critical care medicine

Table 41 - Pulmonary disease and critical care medicine (June 2017)



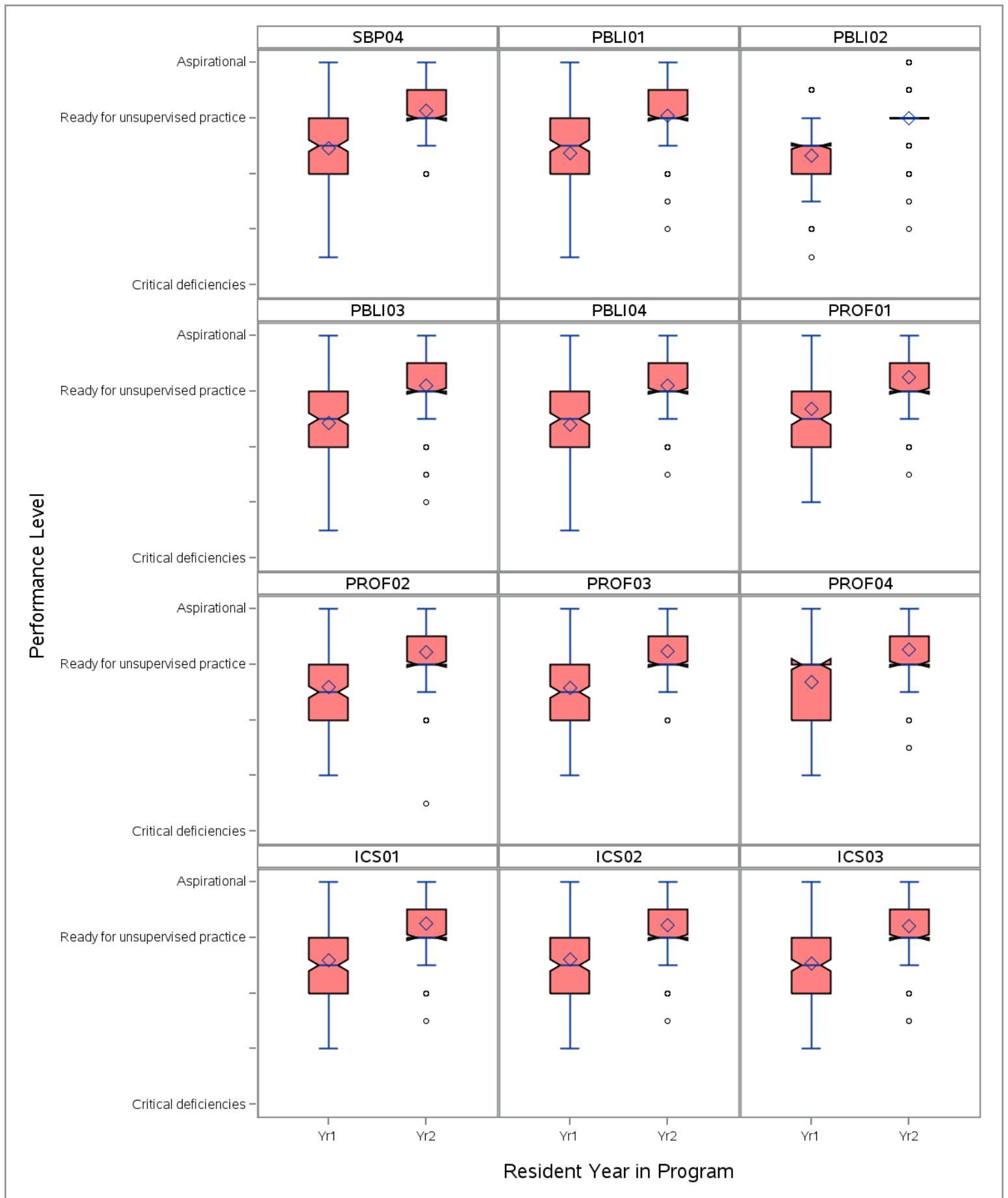
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Table 42 - Rheumatology (June 2017)



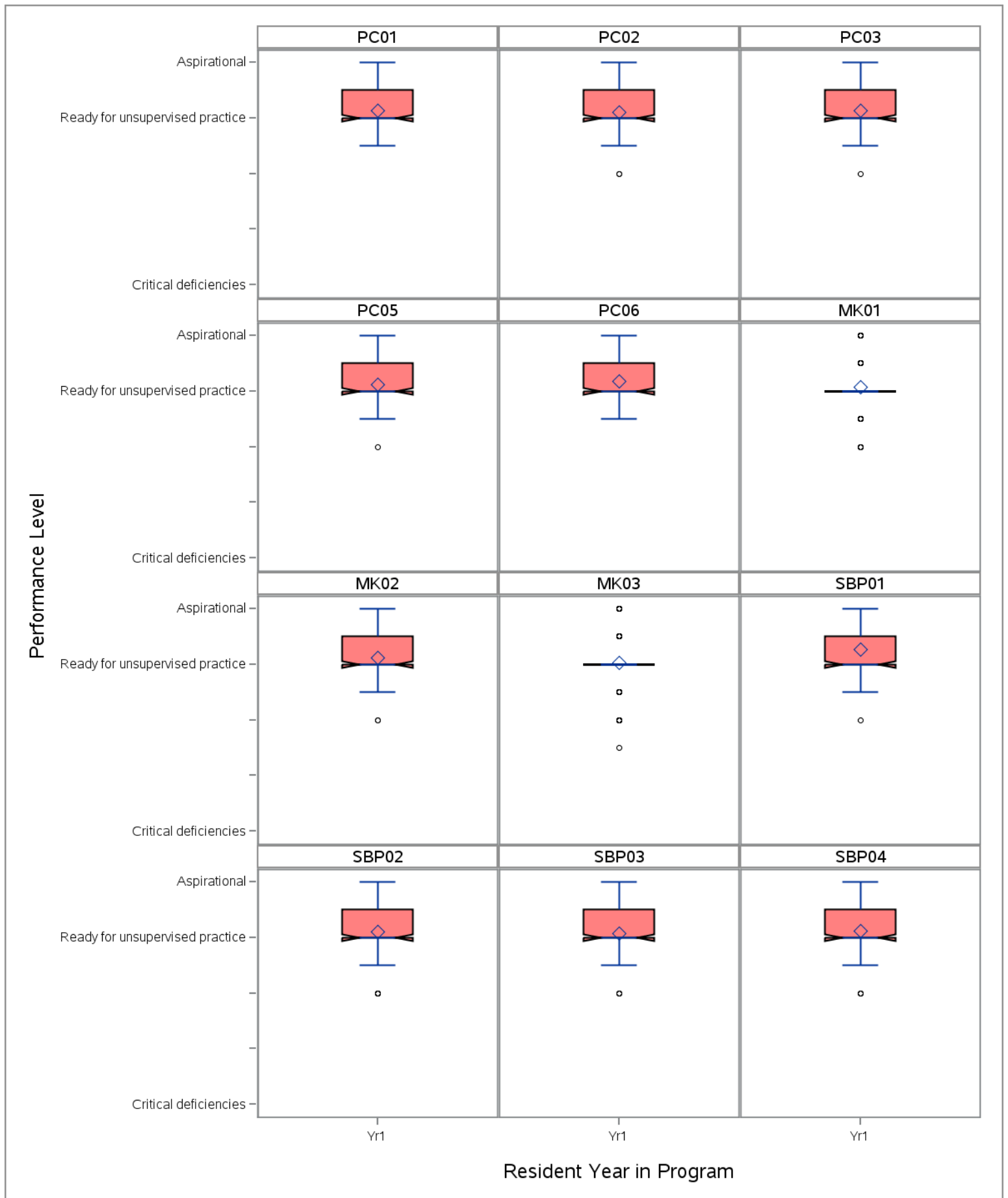
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Table 43 - Sleep medicine (multidisciplinary) (June 2017)



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Table 43 - Sleep medicine (multidisciplinary) (June 2017)

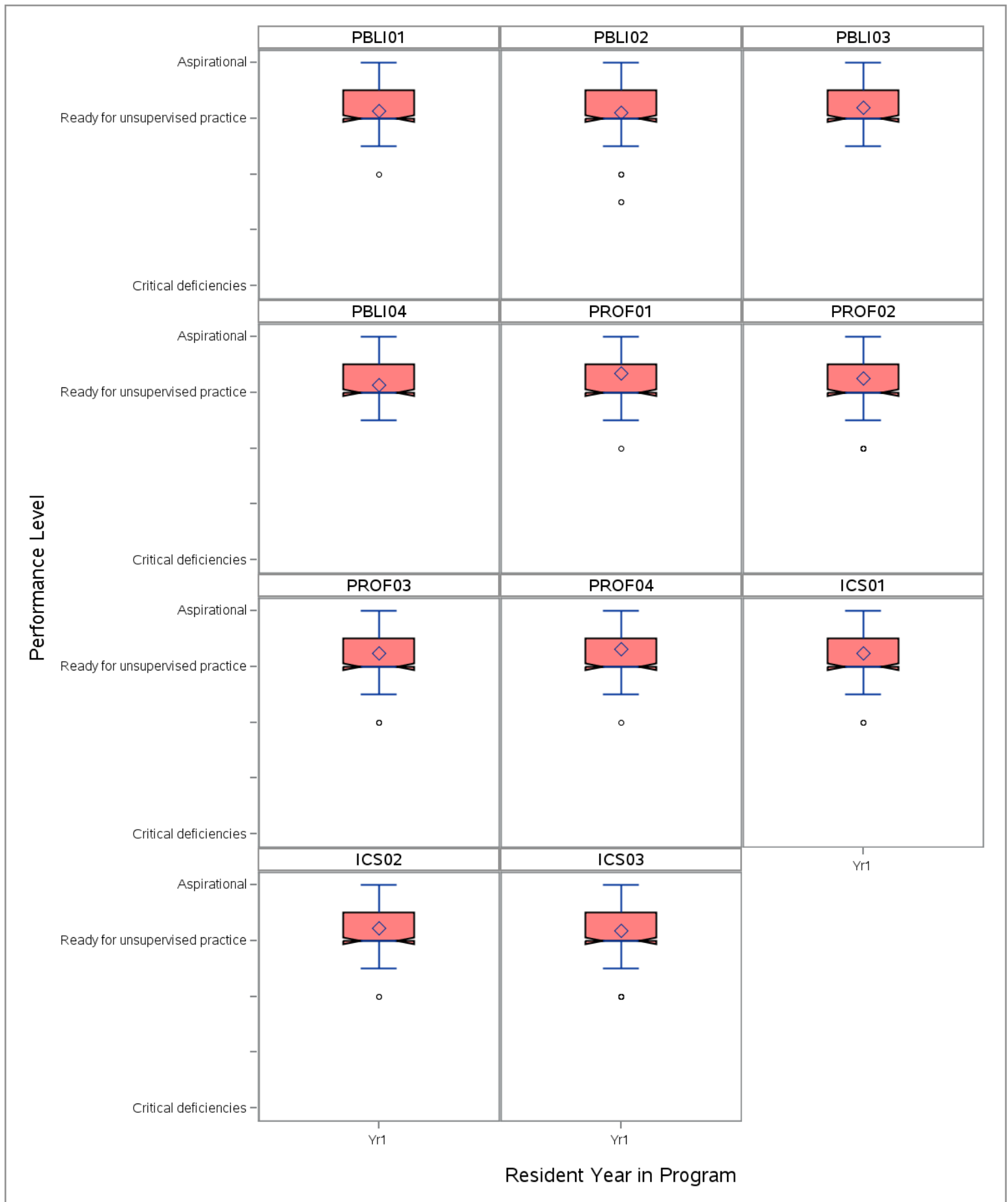
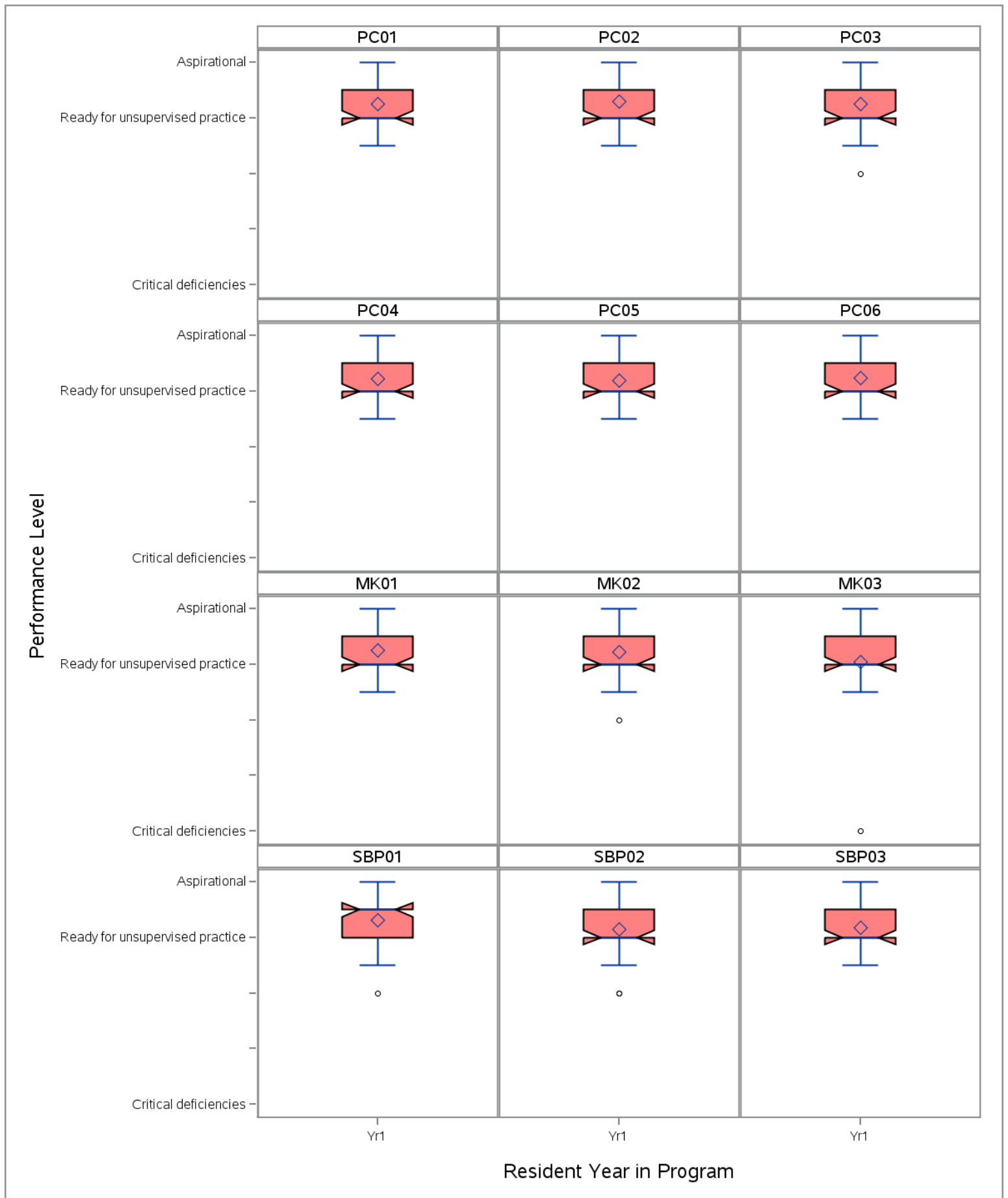


Table 44 - Transplant hepatology (June 2017)



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Table 44 - Transplant hepatology (June 2017)

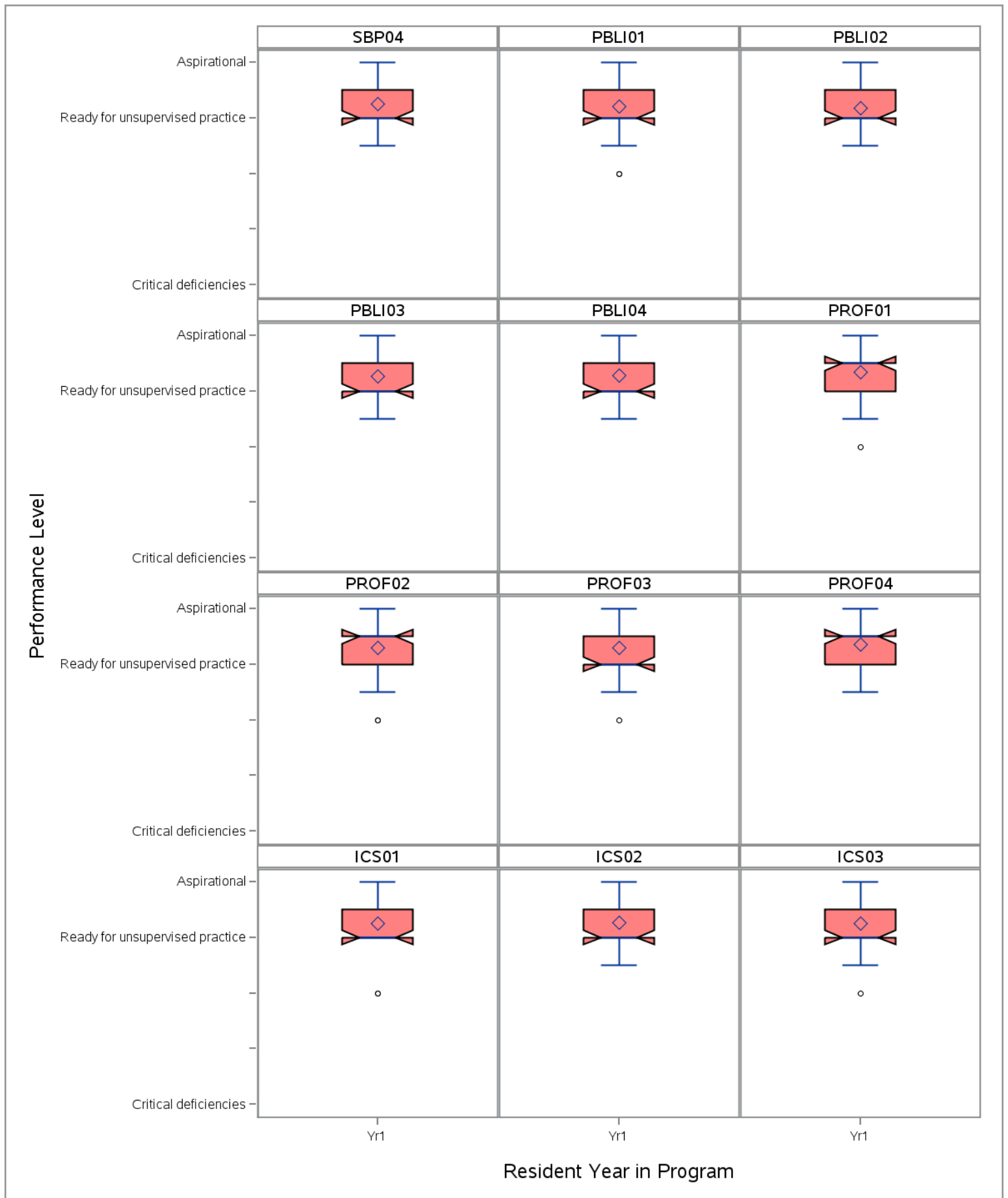
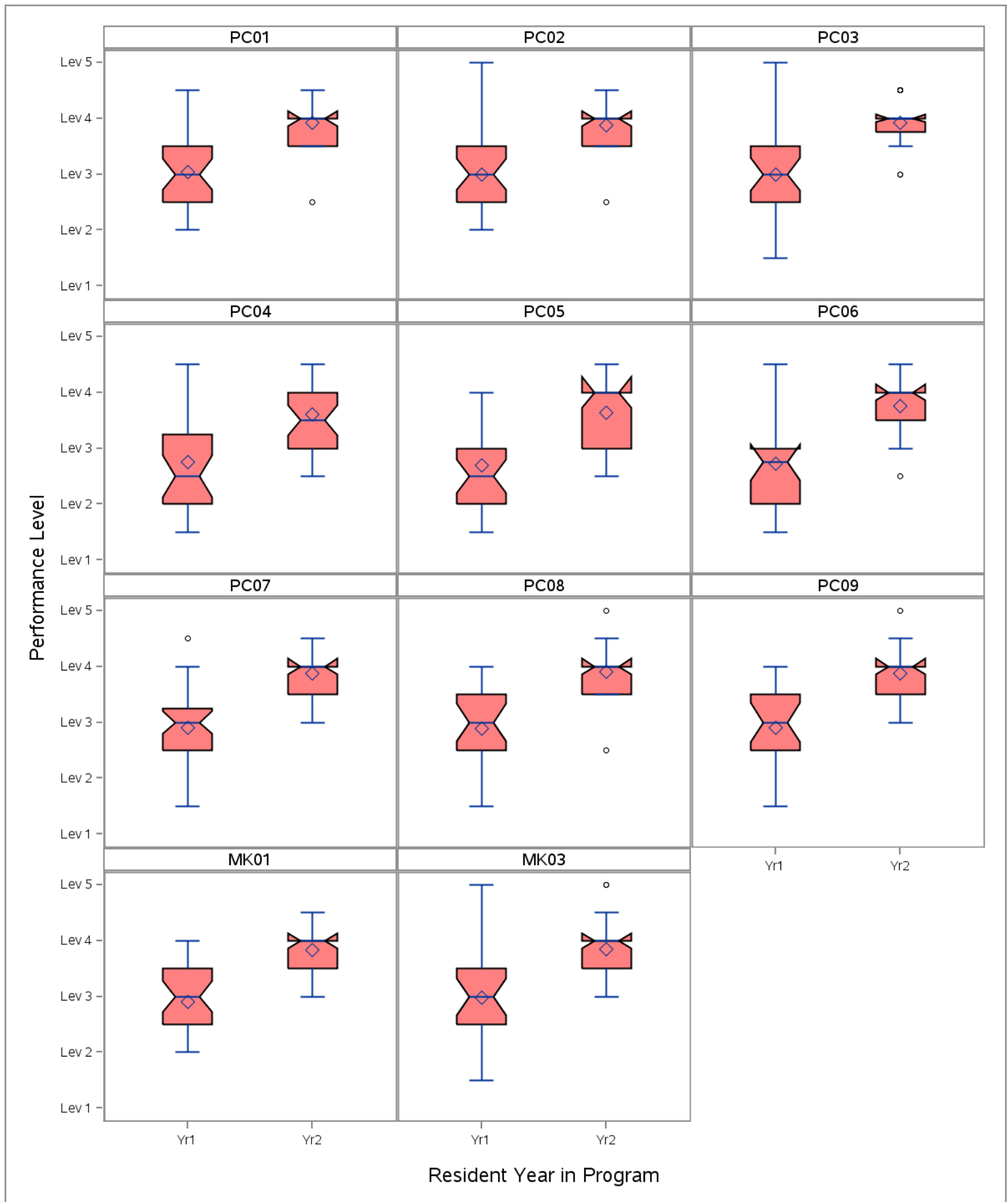


Table 45 - Medical genetics and genomics (June 2017)



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Table 45 - Medical genetics and genomics (June 2017)

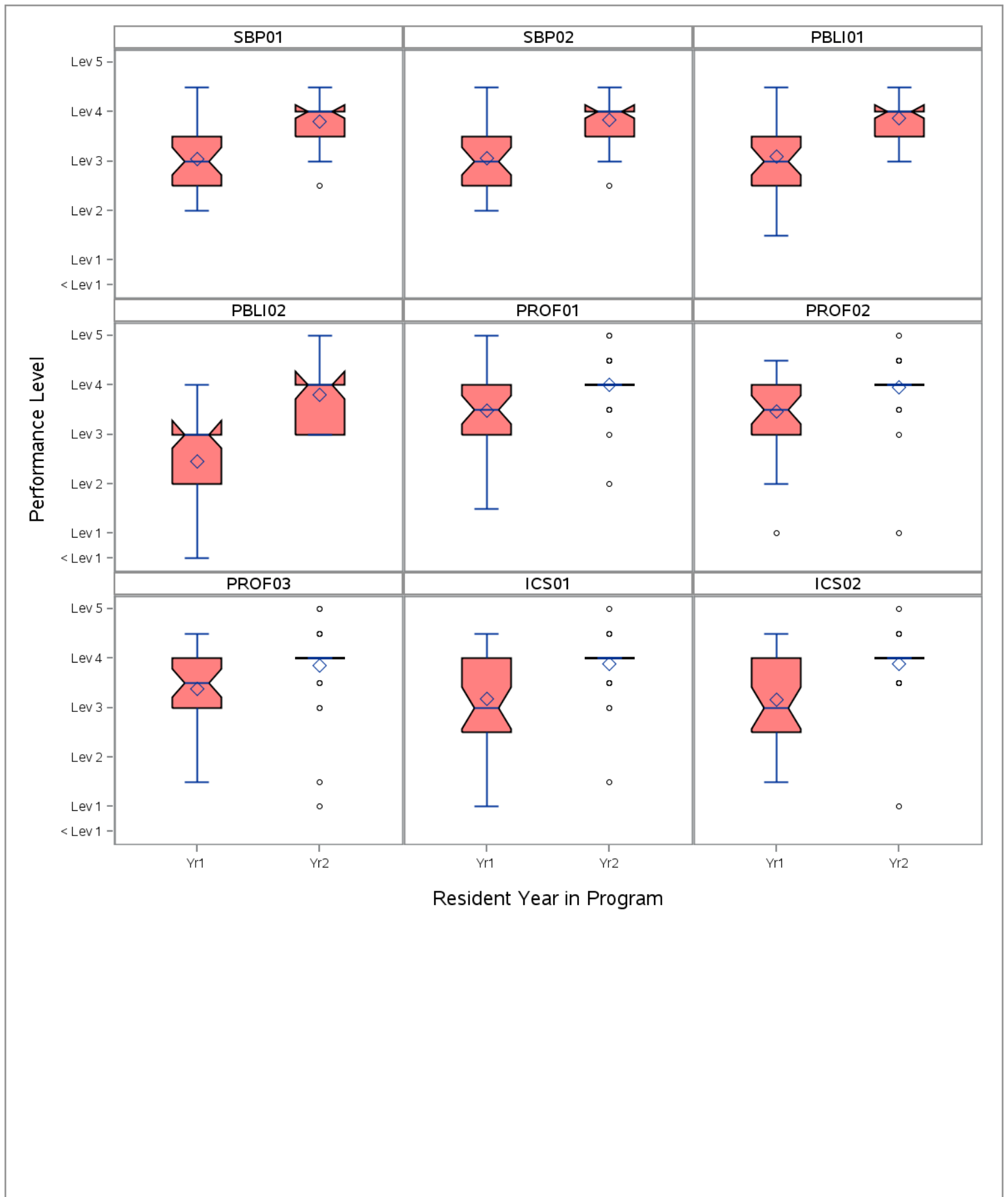
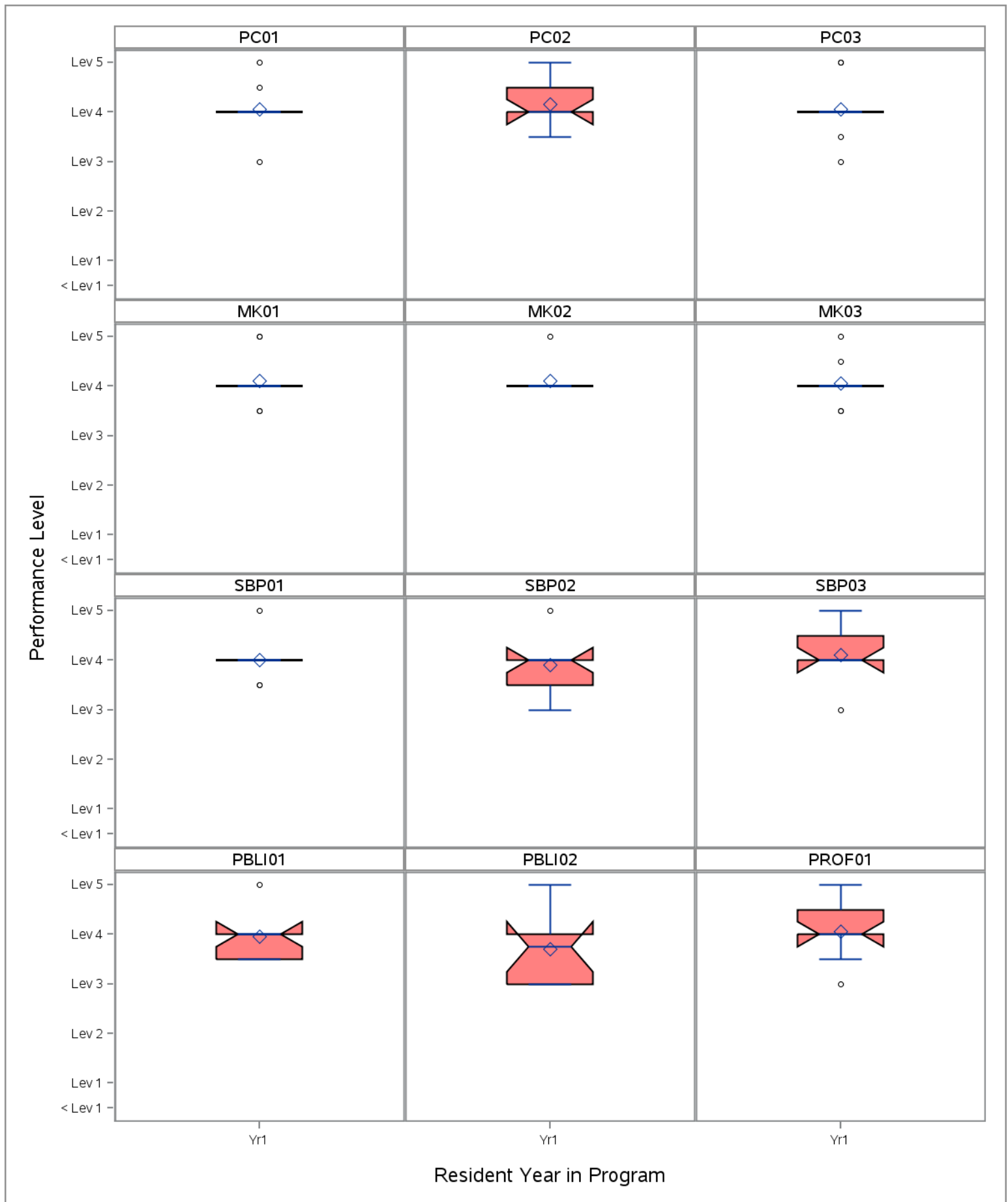


Table 46 - Medical biochemical genetics (June 2017)



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Table 46 - Medical biochemical genetics (June 2017)

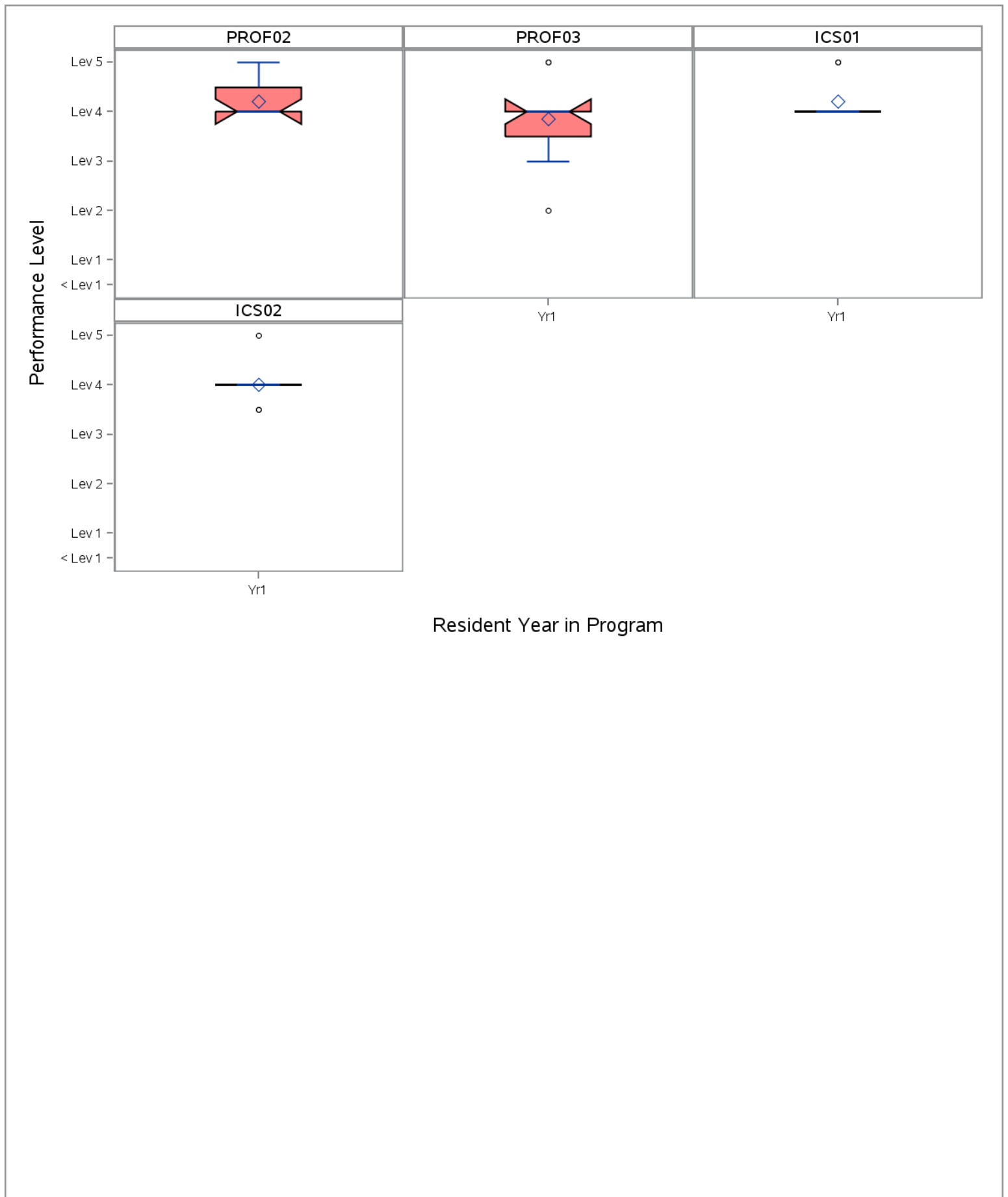
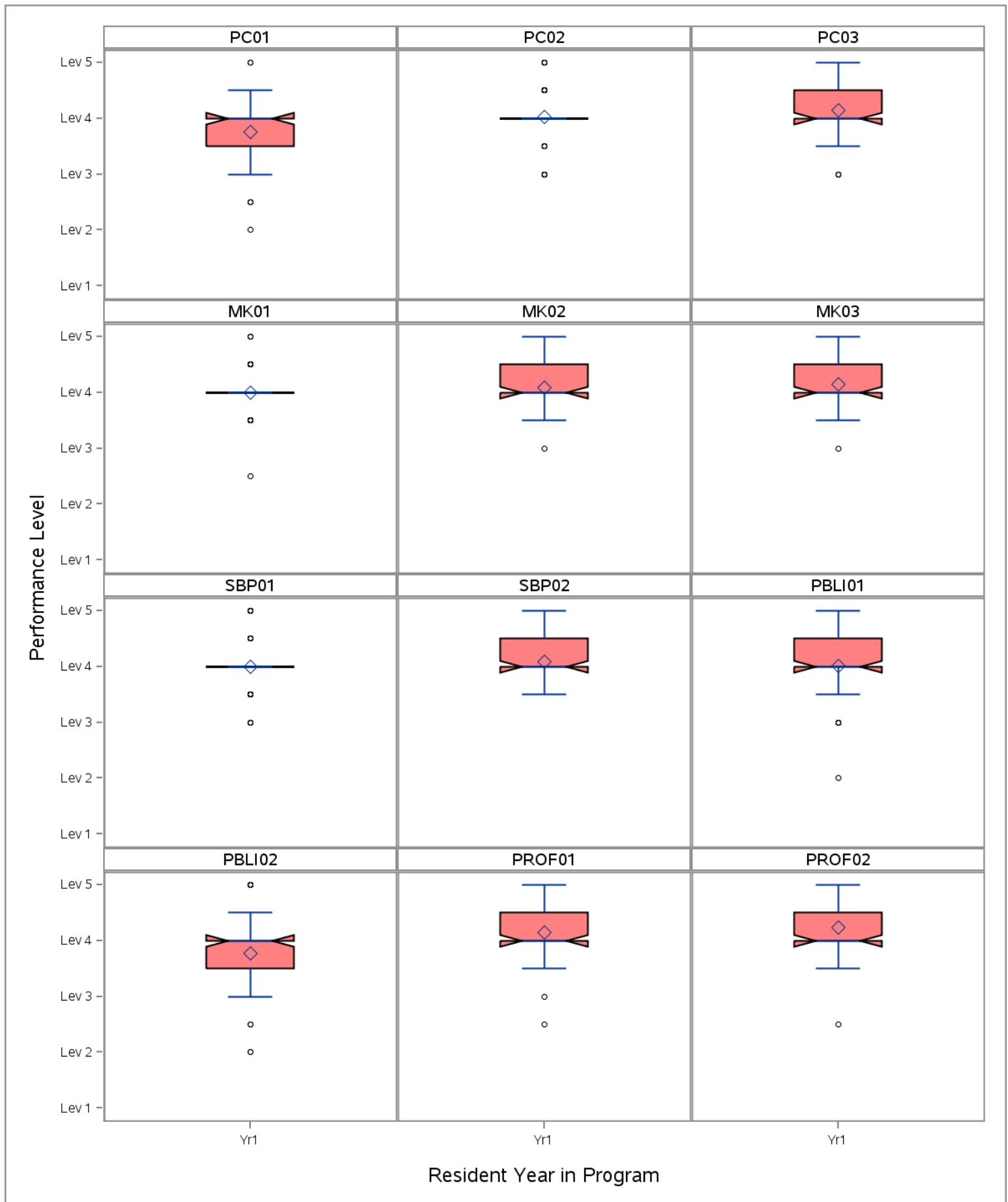


Table 47 - Molecular genetic pathology (multidisciplinary) (June 2017)



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Table 47 - Molecular genetic pathology (multidisciplinary) (June 2017)

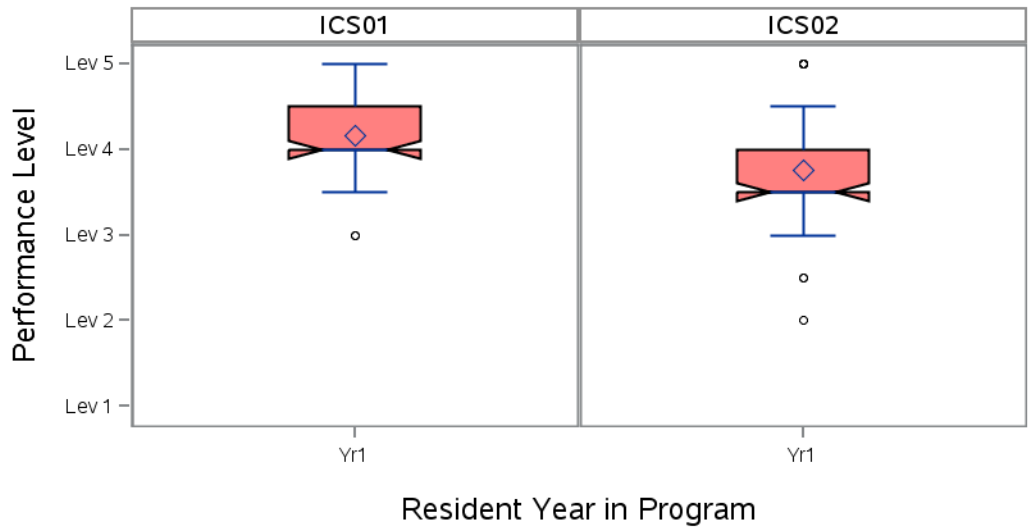
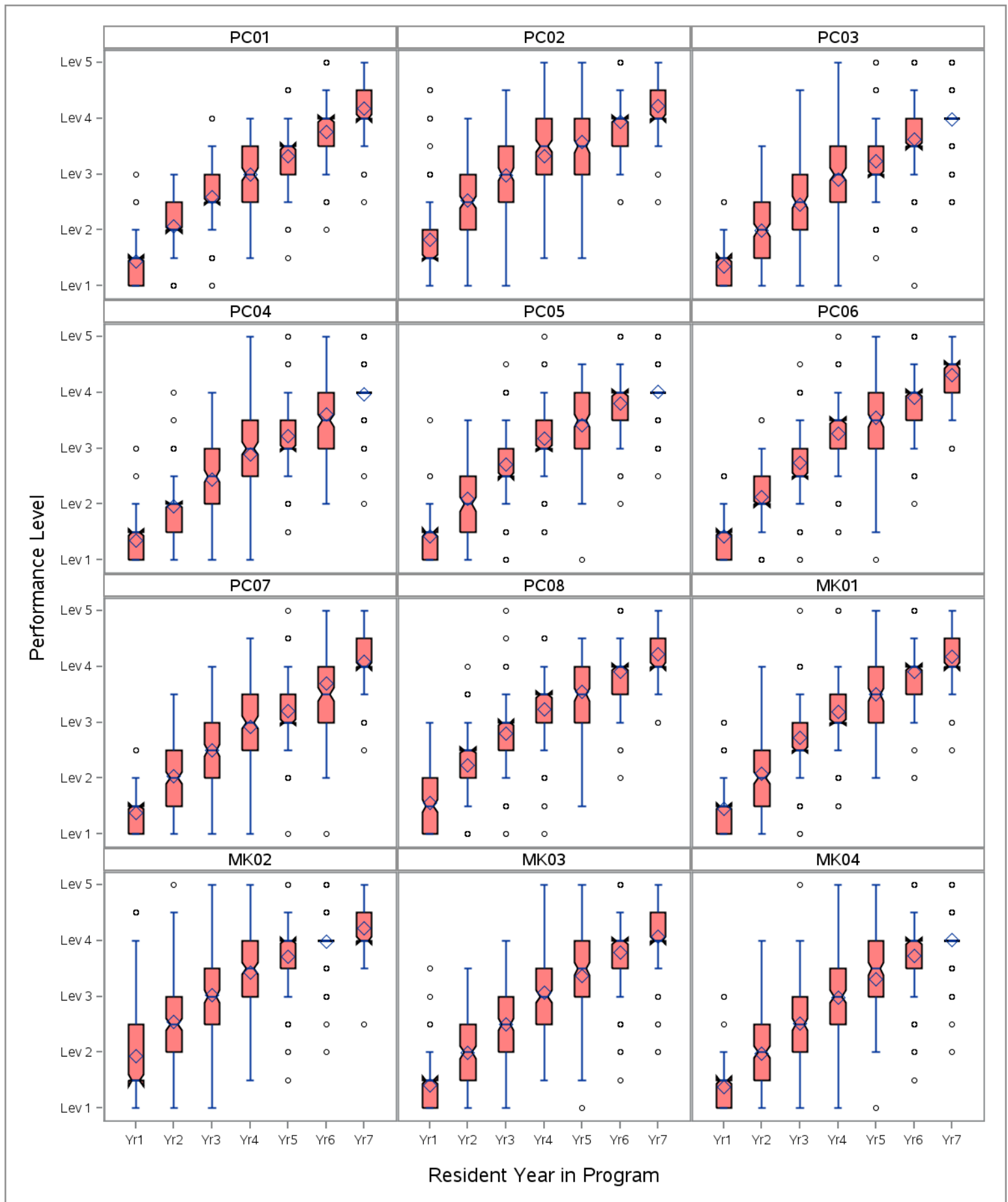
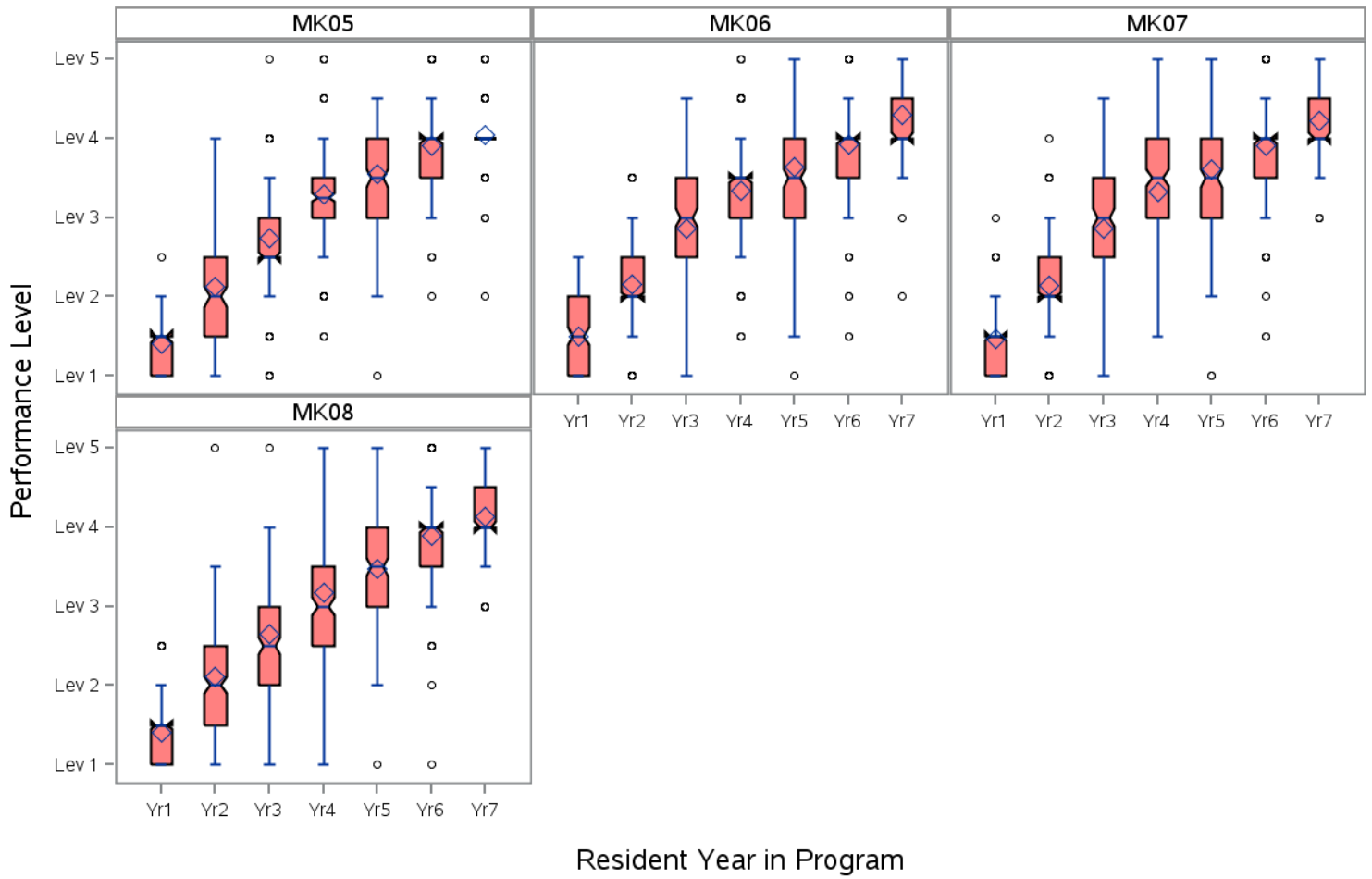


Table 48 - Neurological surgery (June 2017)



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Table 48 - Neurological surgery (June 2017)



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Table 48 - Neurological surgery (June 2017)

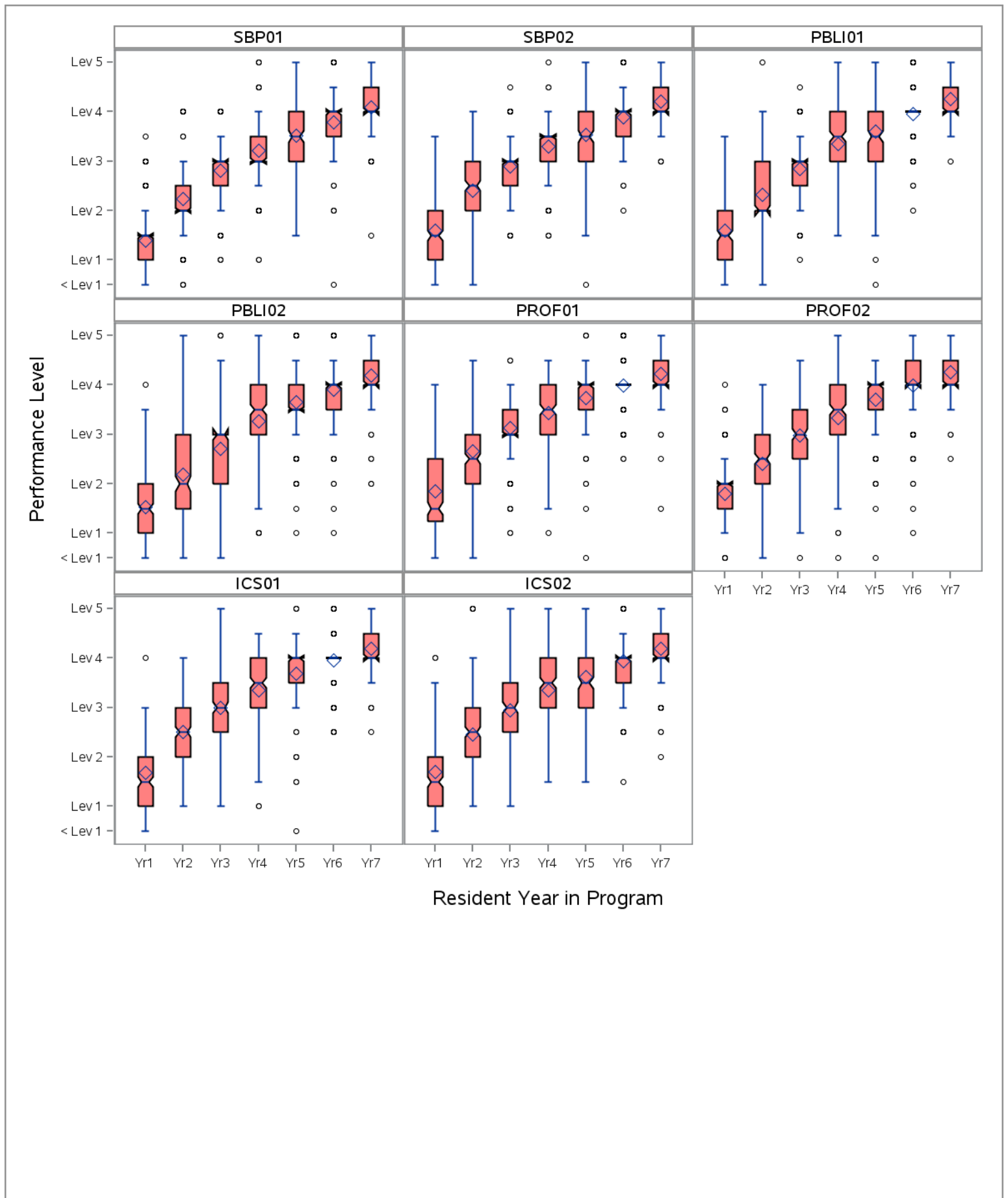
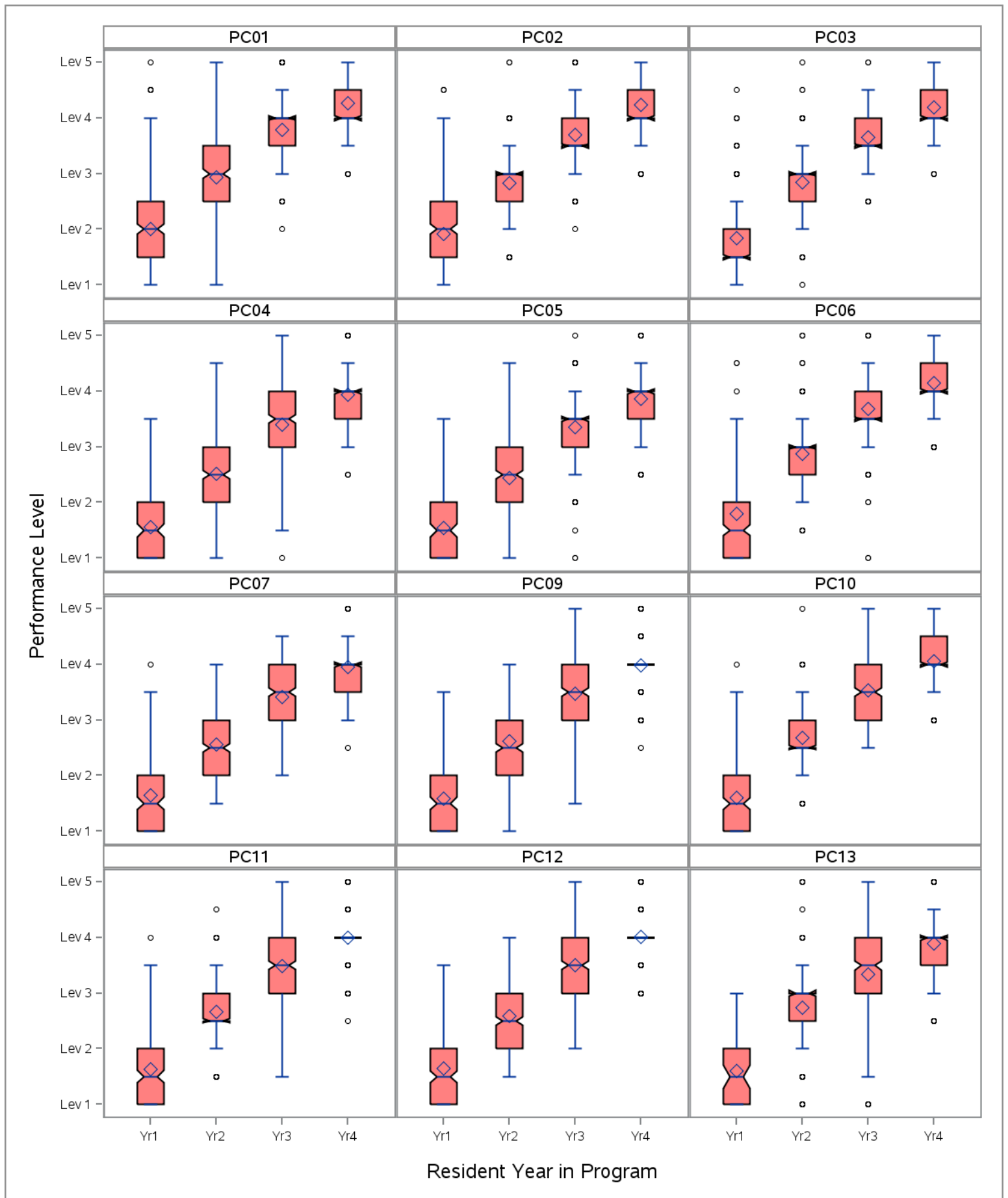
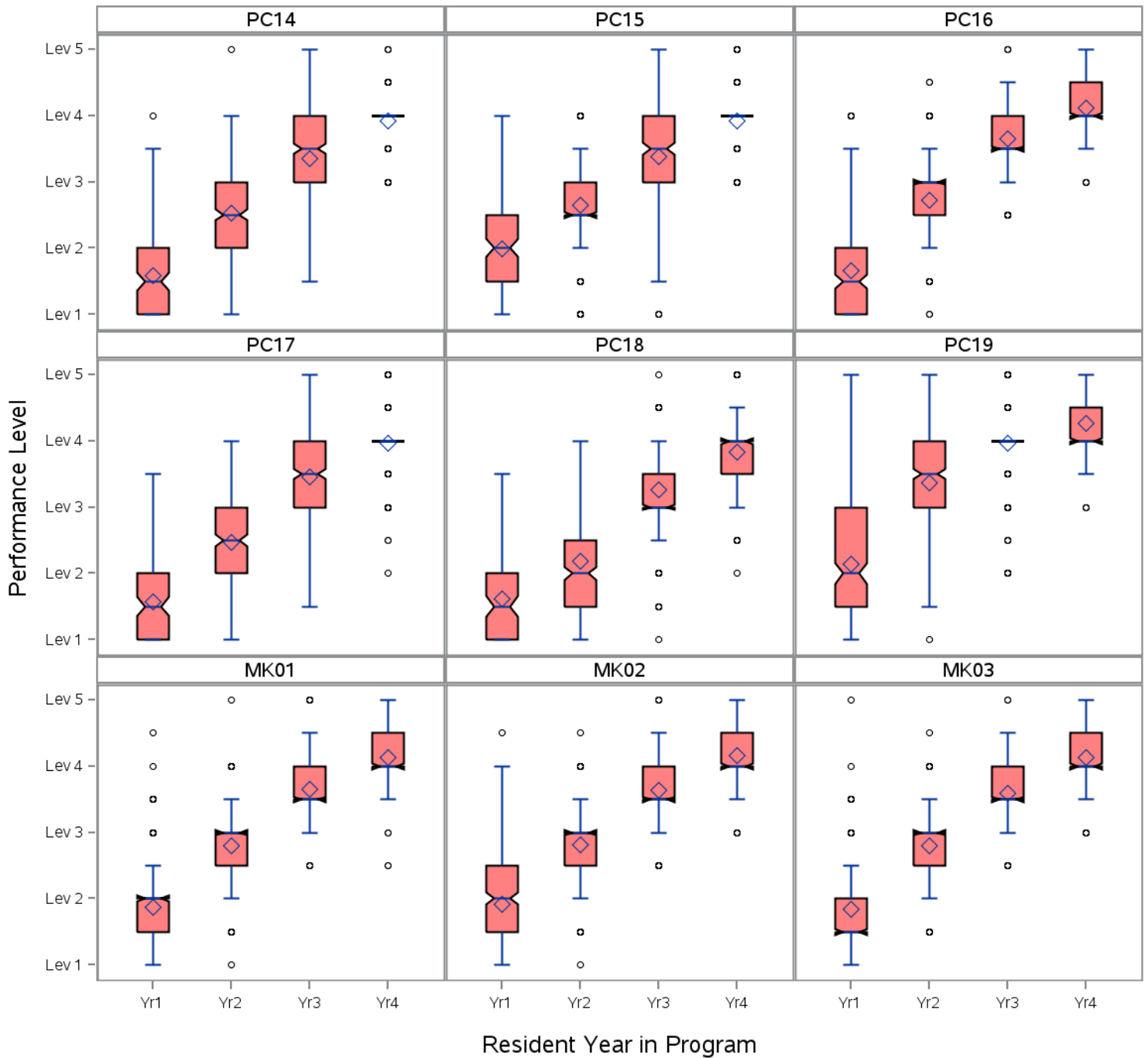


Table 49 - Neurology (June 2017)



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Table 49 - Neurology (June 2017)



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Table 49 - Neurology (June 2017)

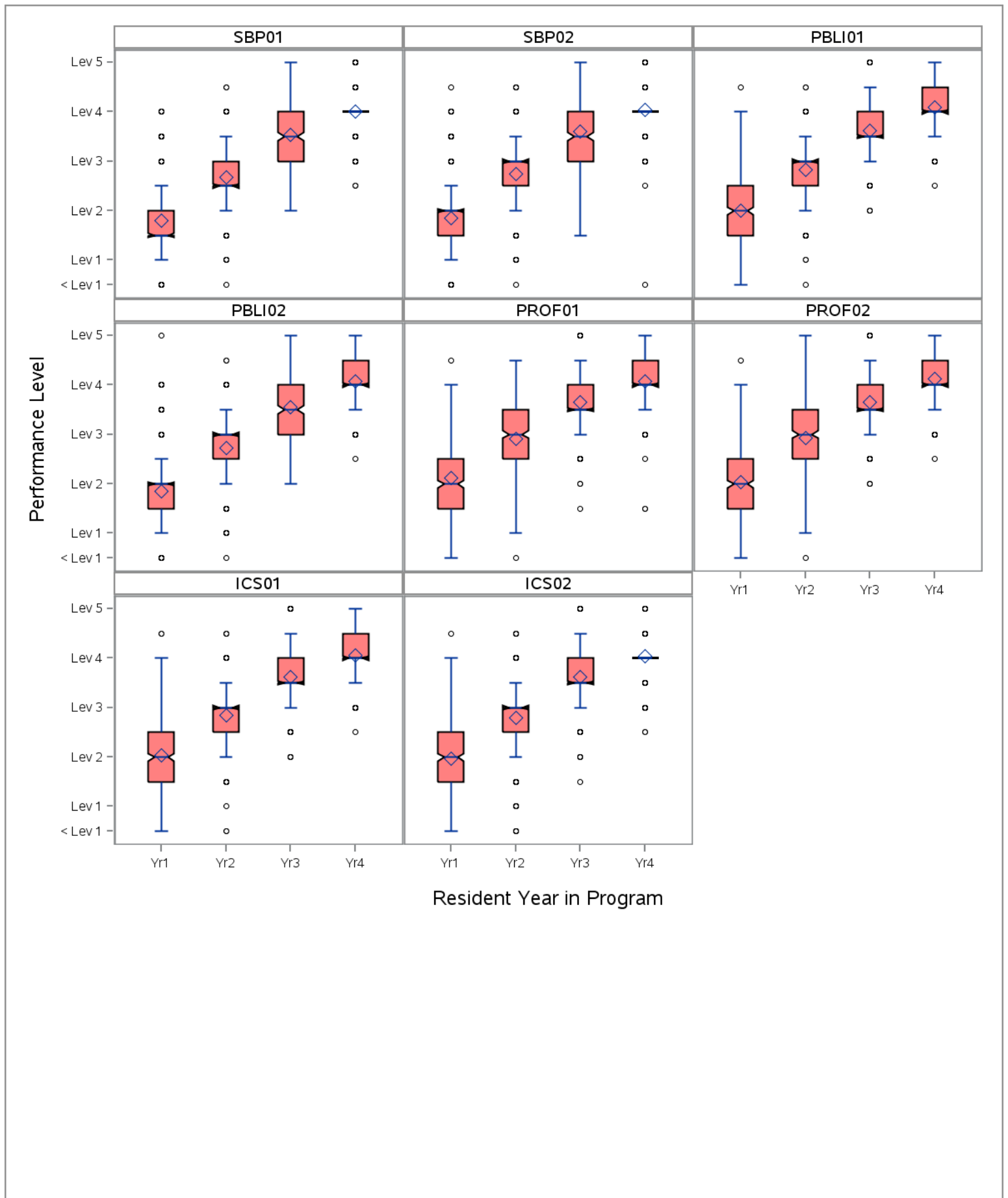
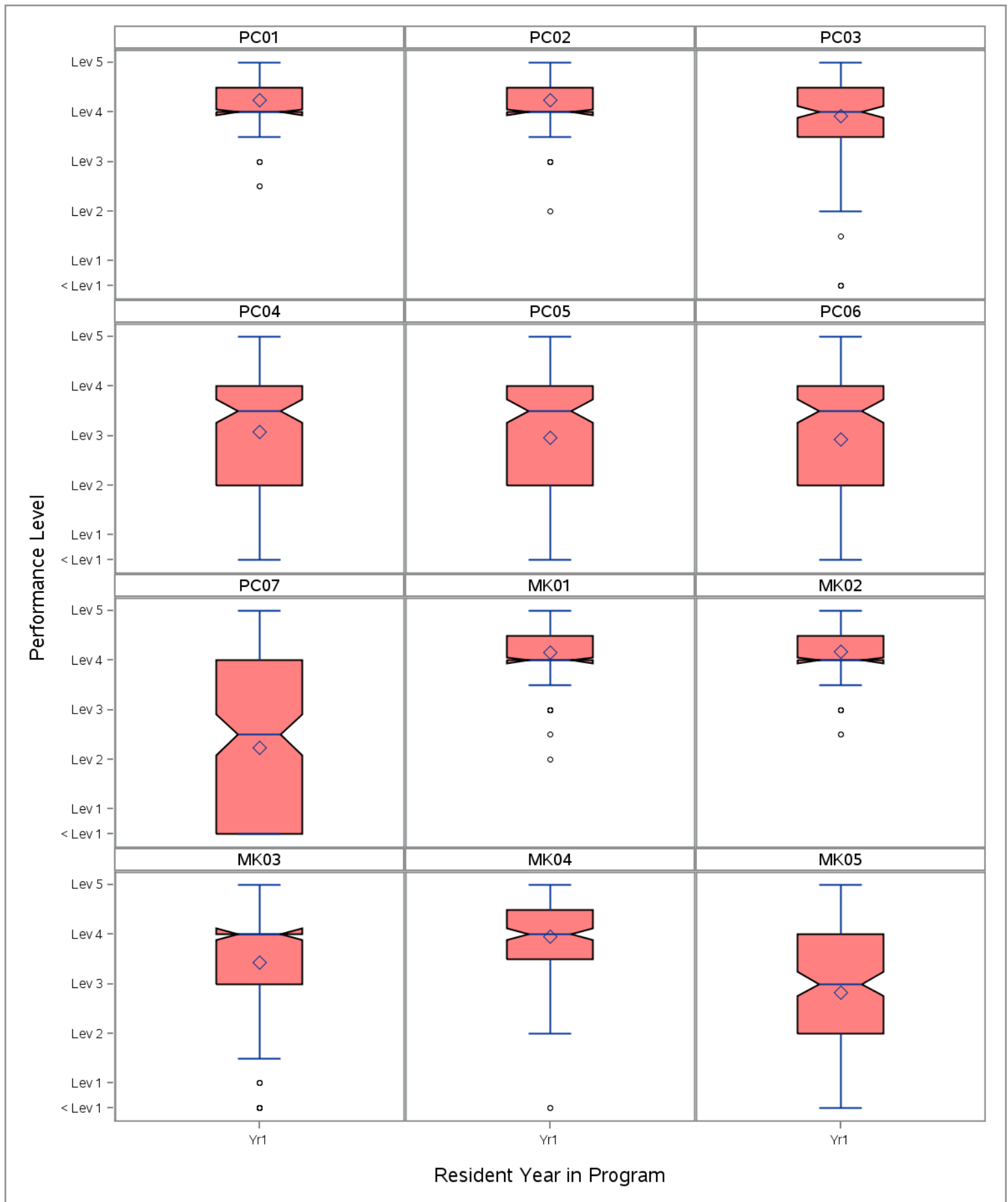
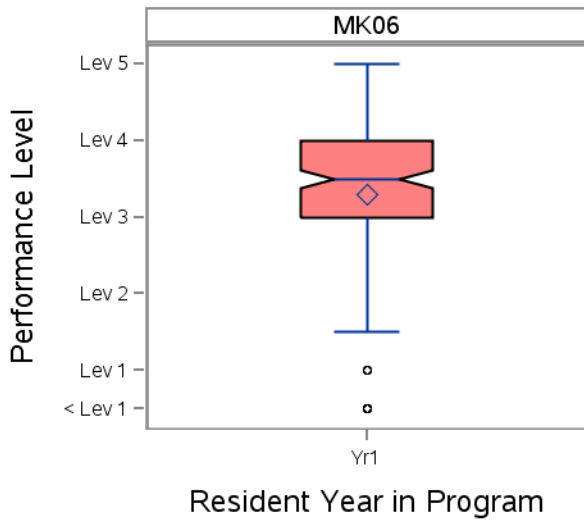


Table 50 - Clinical neurophysiology (June 2017)



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Table 50 - Clinical neurophysiology (June 2017)



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Table 50 - Clinical neurophysiology (June 2017)

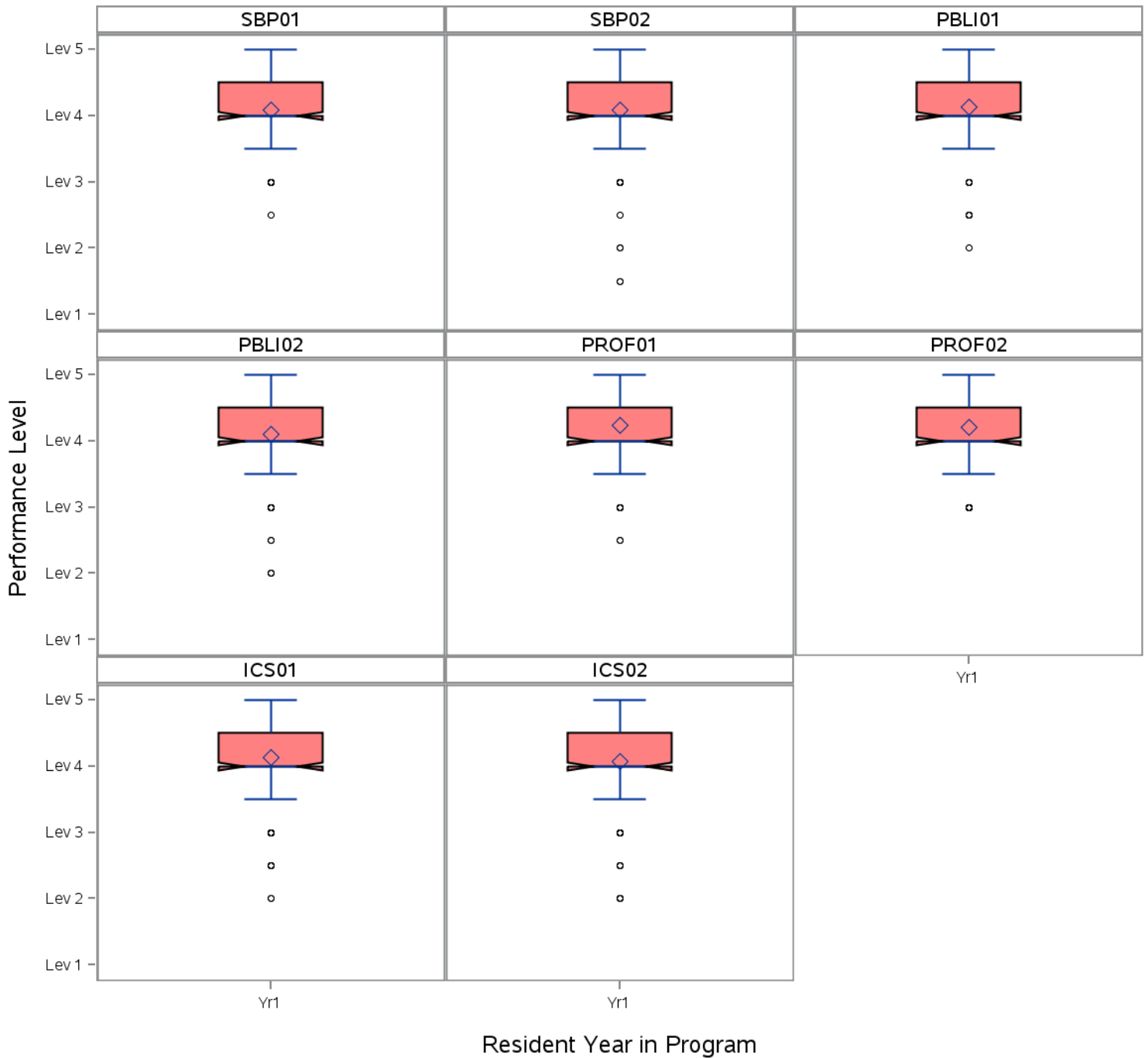
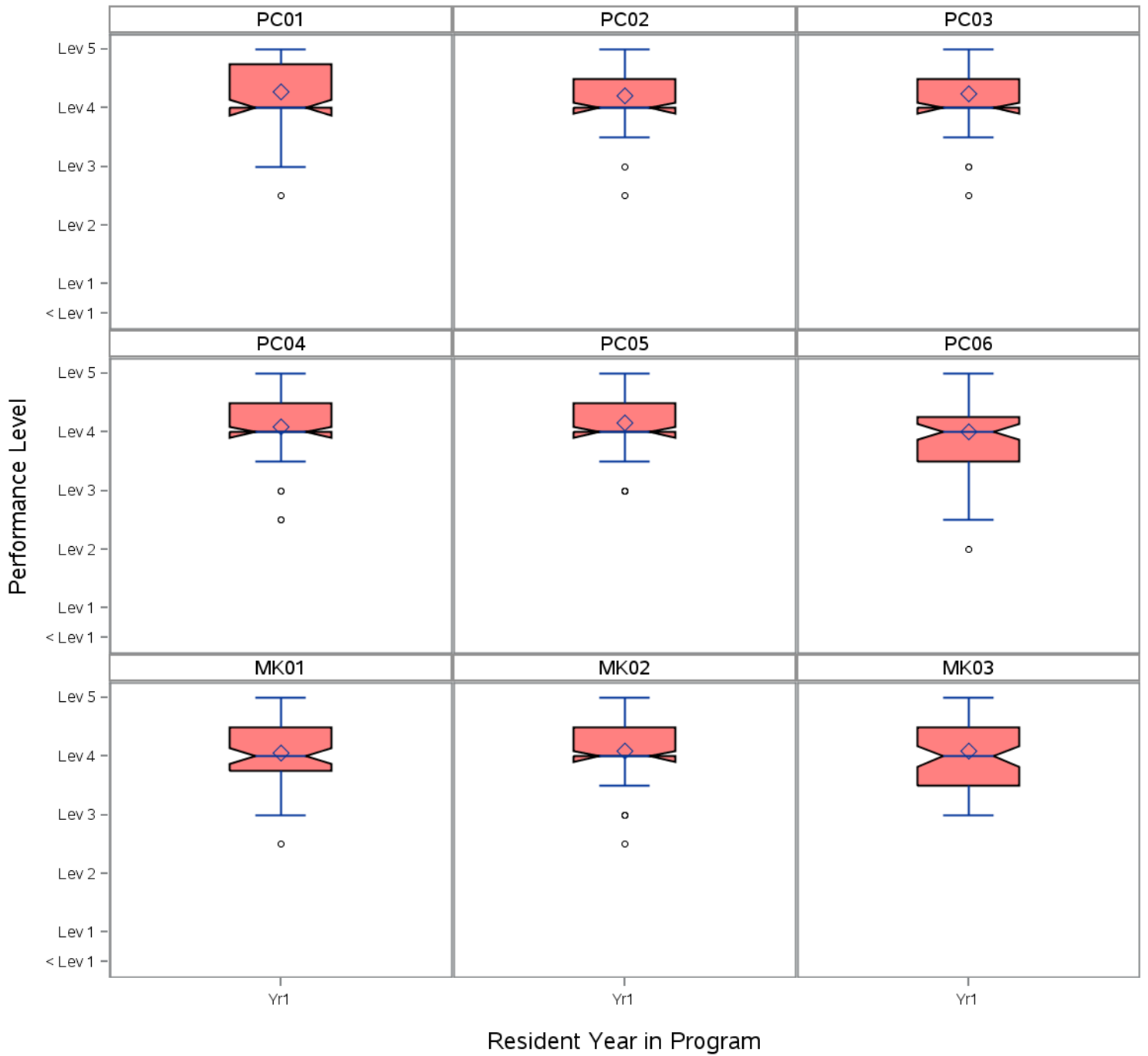


Table 51 - Epilepsy (June 2017)



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Table 51 - Epilepsy (June 2017)

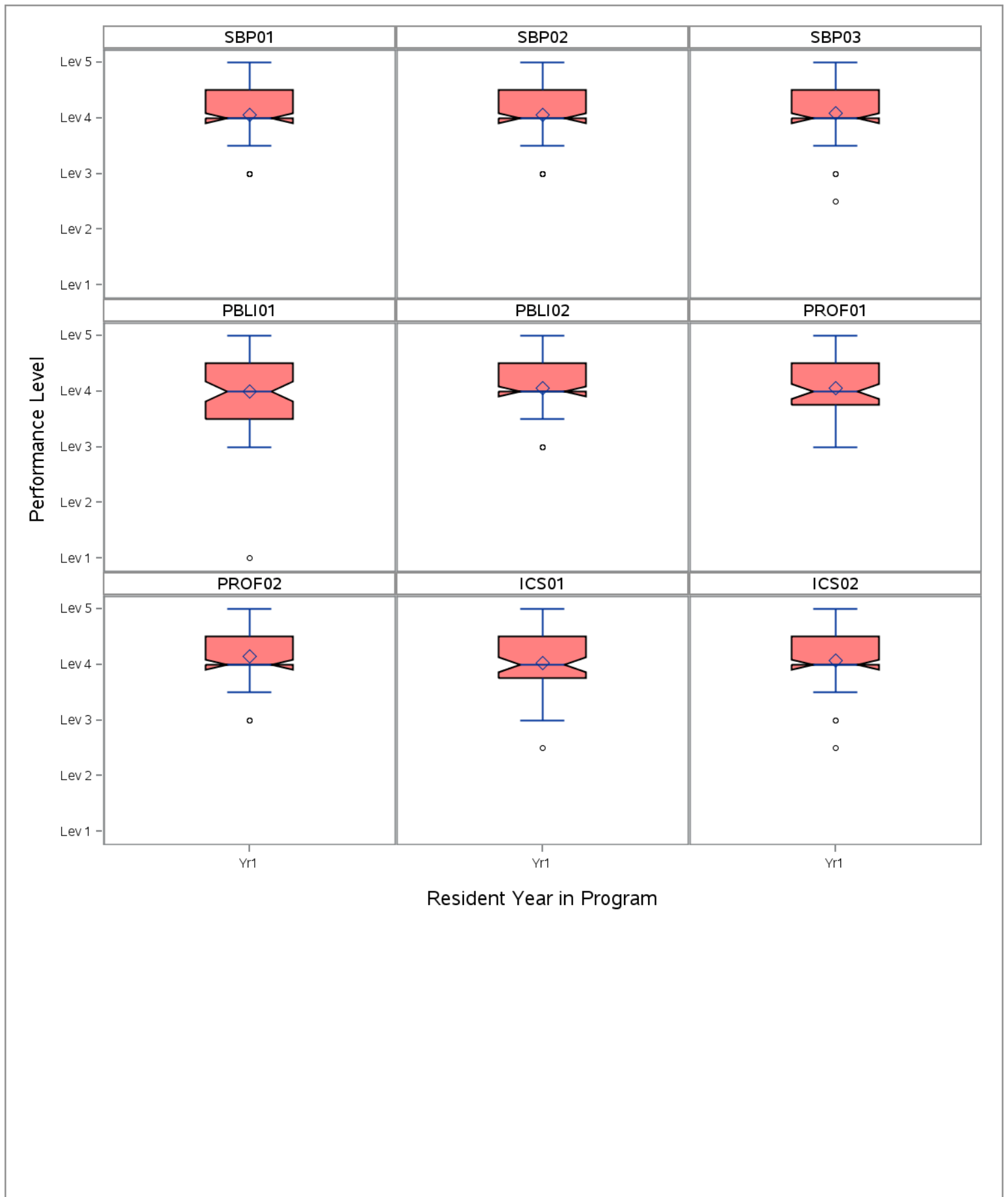
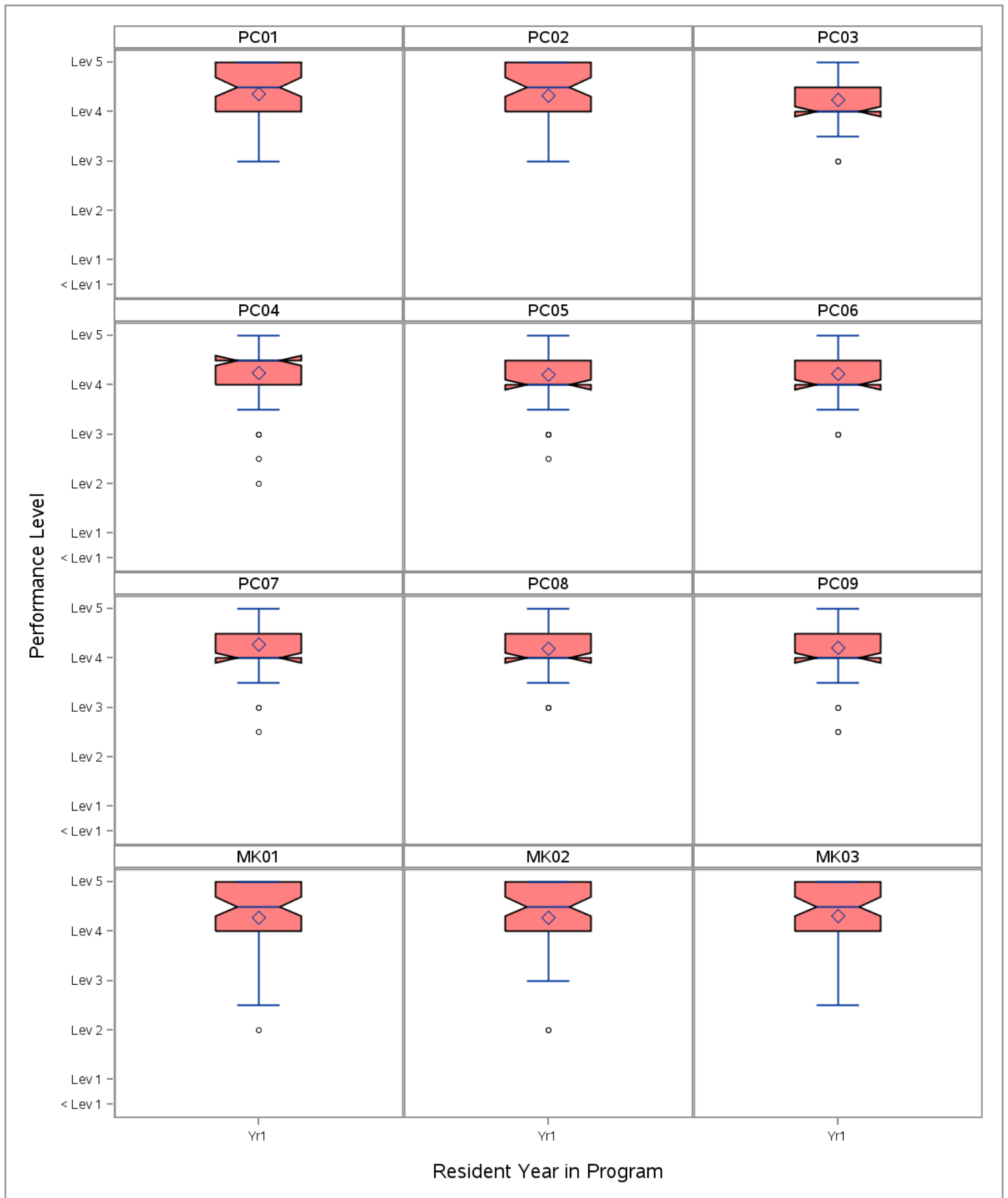


Table 52 - Neuromuscular medicine (June 2017)



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Table 52 - Neuromuscular medicine (June 2017)

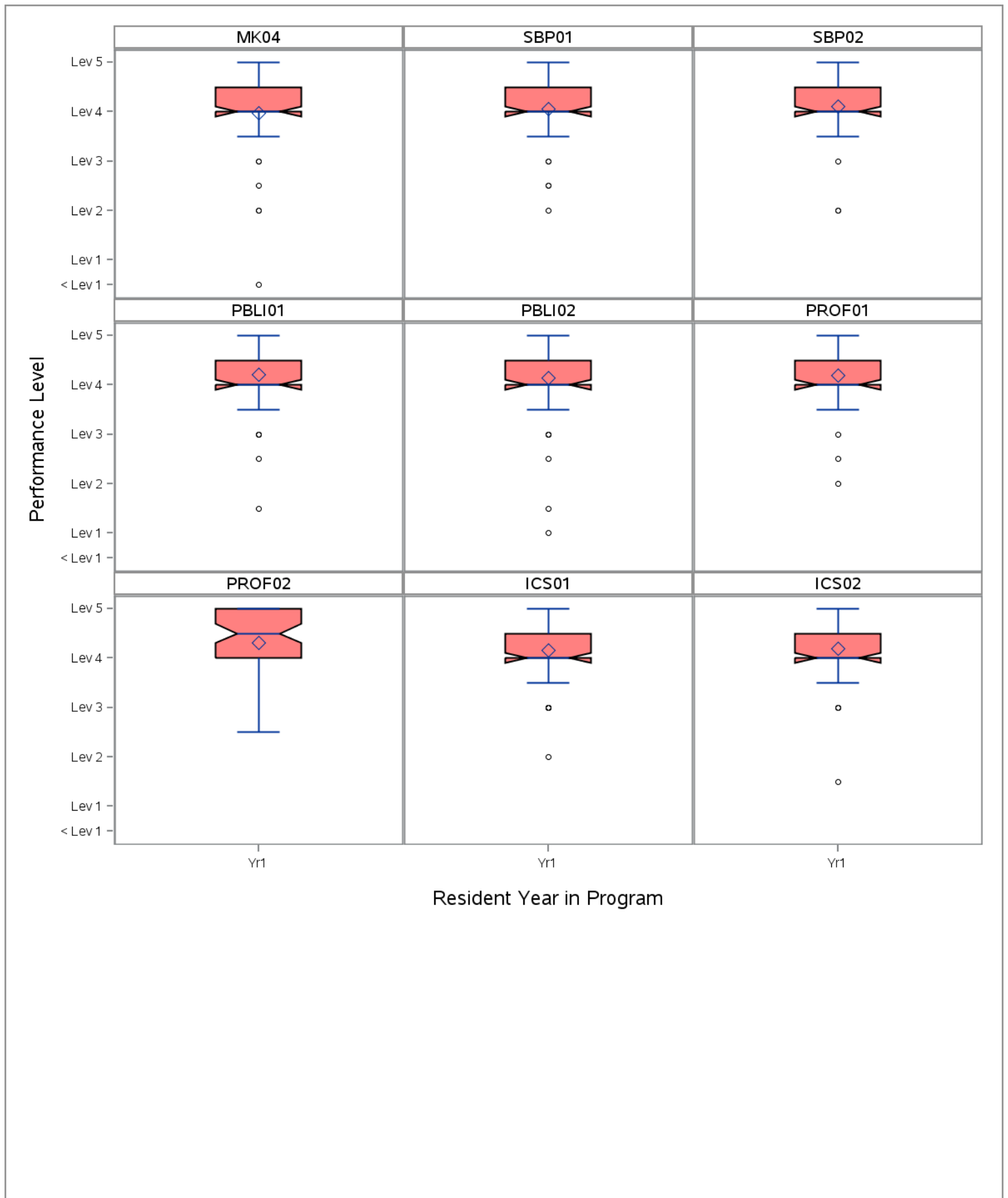
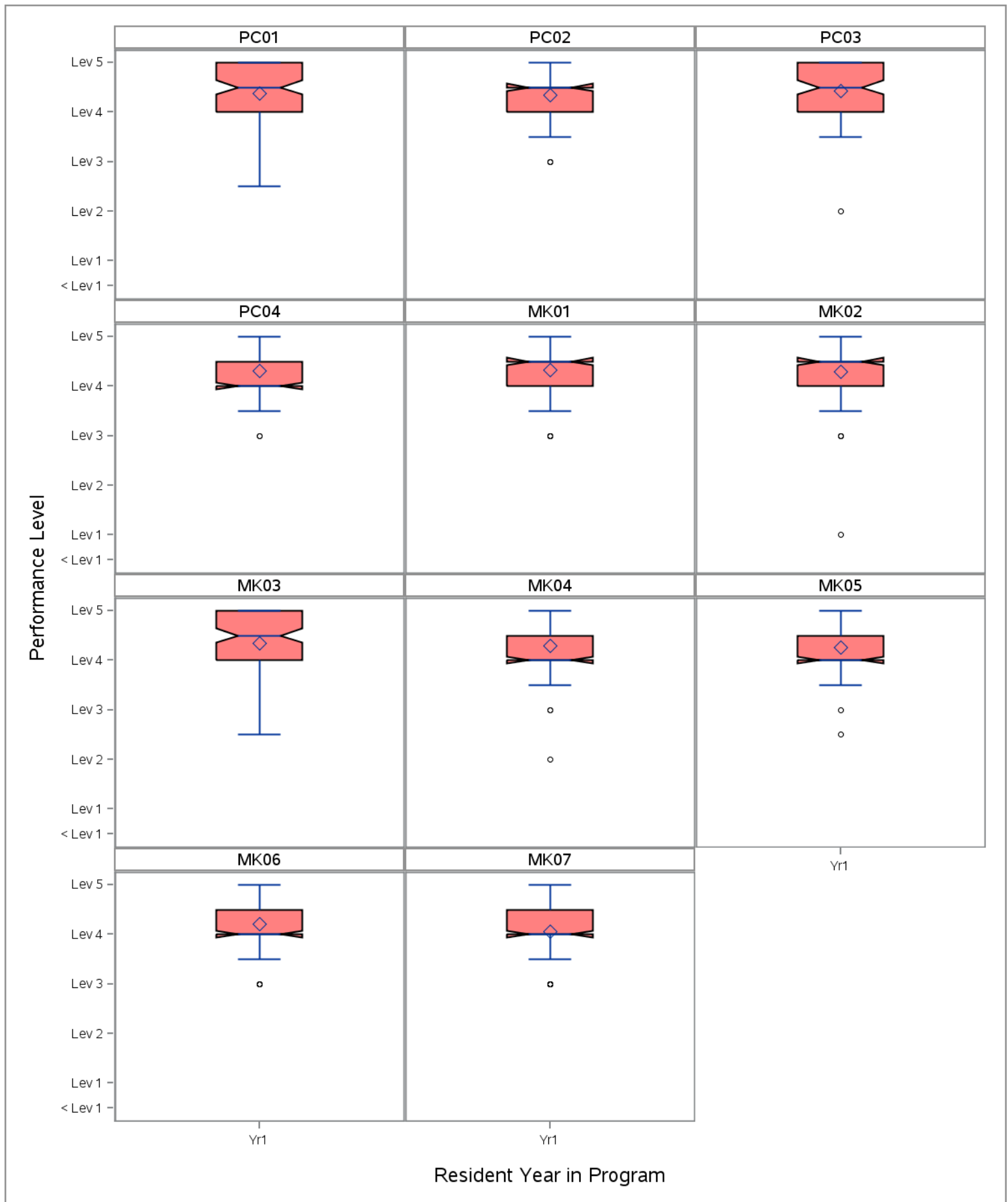


Table 53 - Vascular neurology (June 2017)



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Table 53 - Vascular neurology (June 2017)

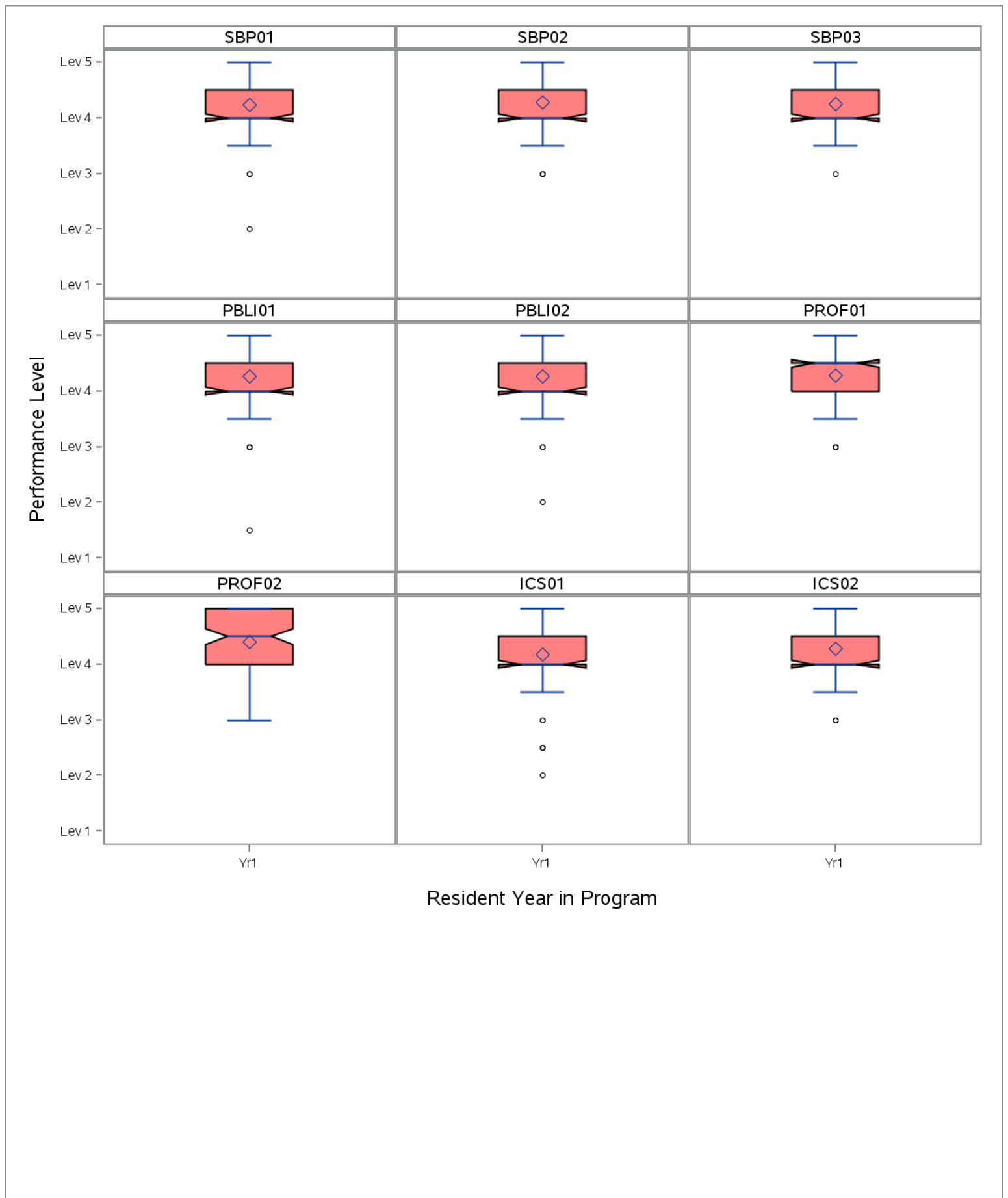
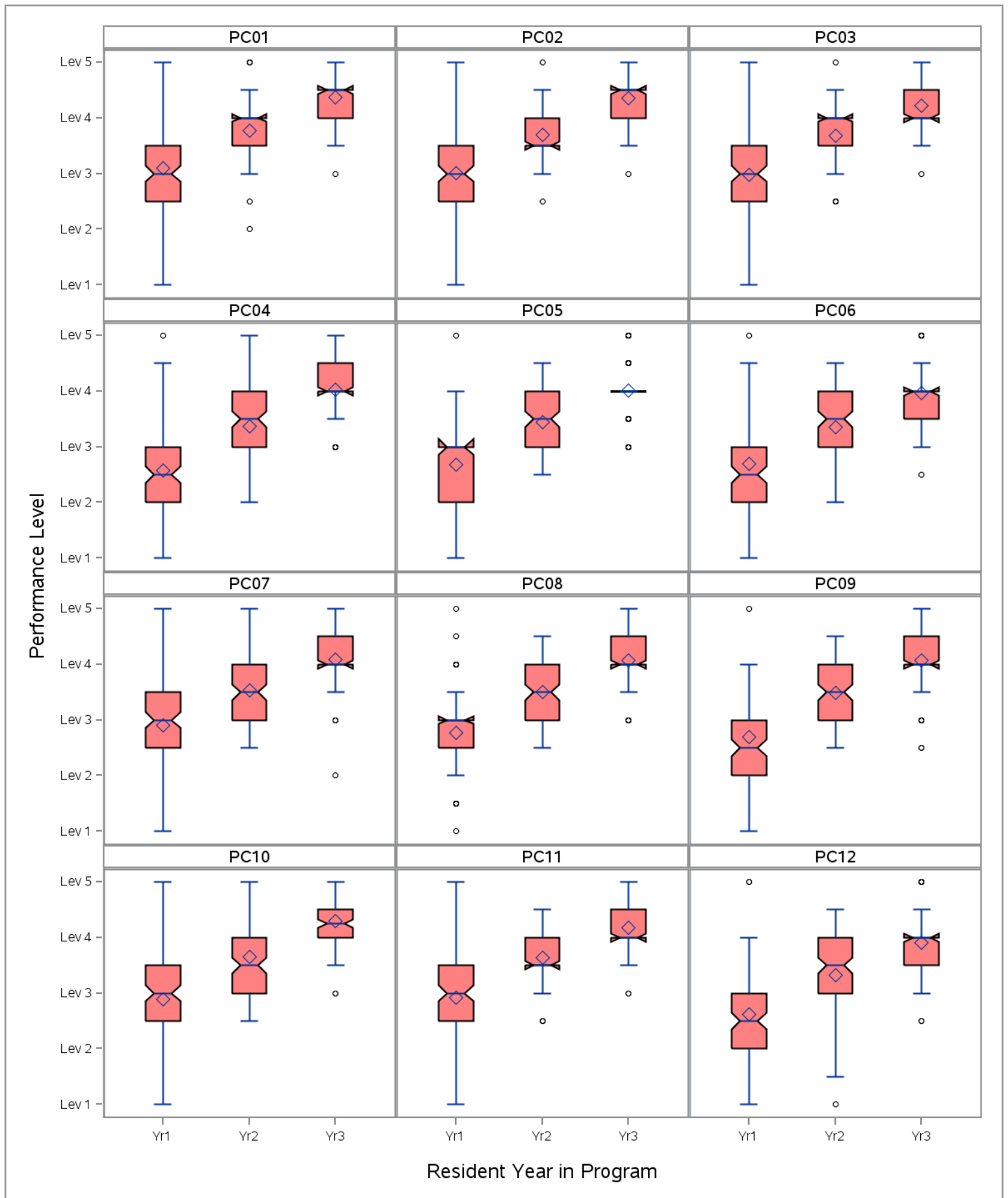
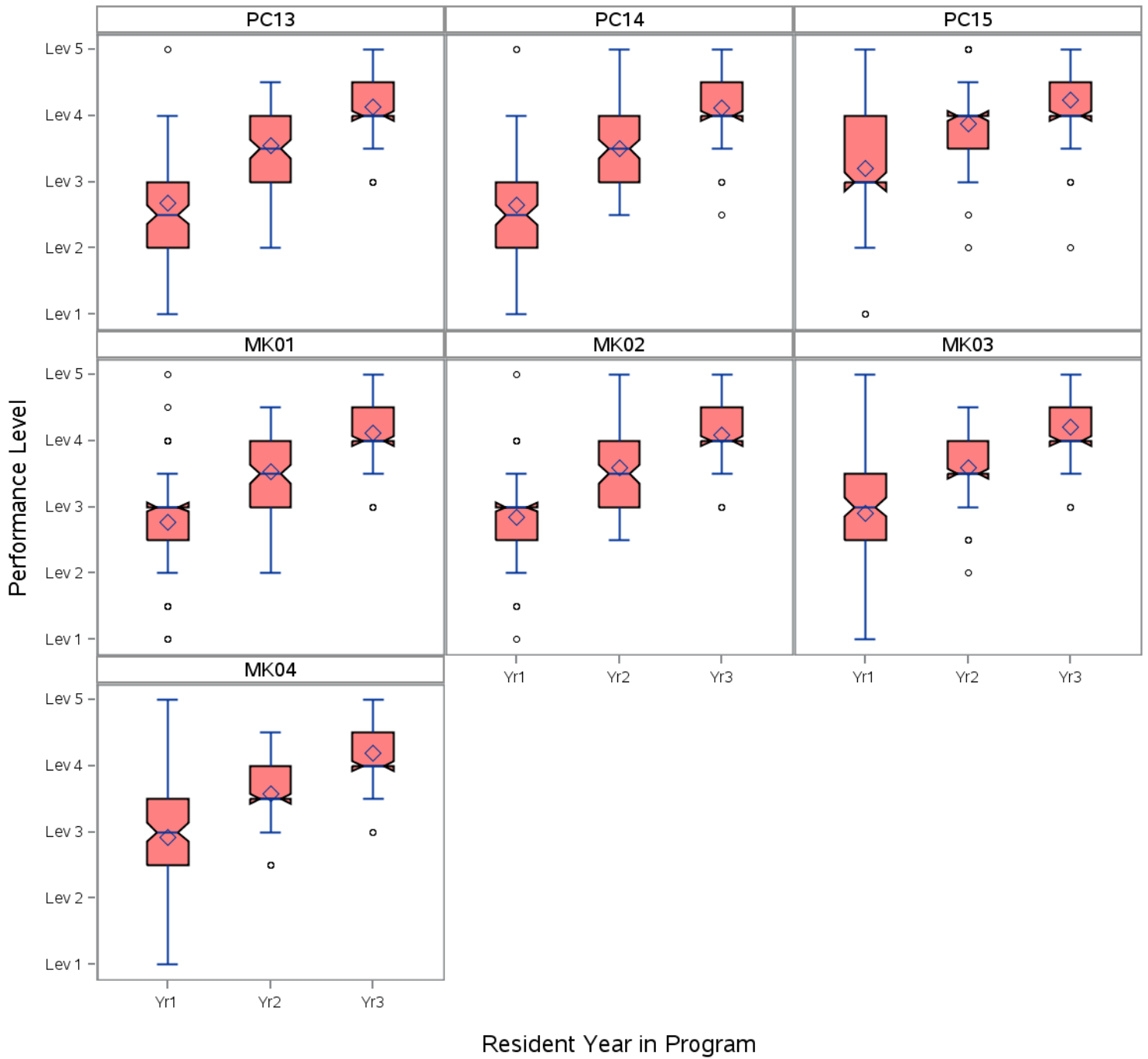


Table 54 - Child neurology (June 2017)



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Table 54 - Child neurology (June 2017)



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Table 54 - Child neurology (June 2017)

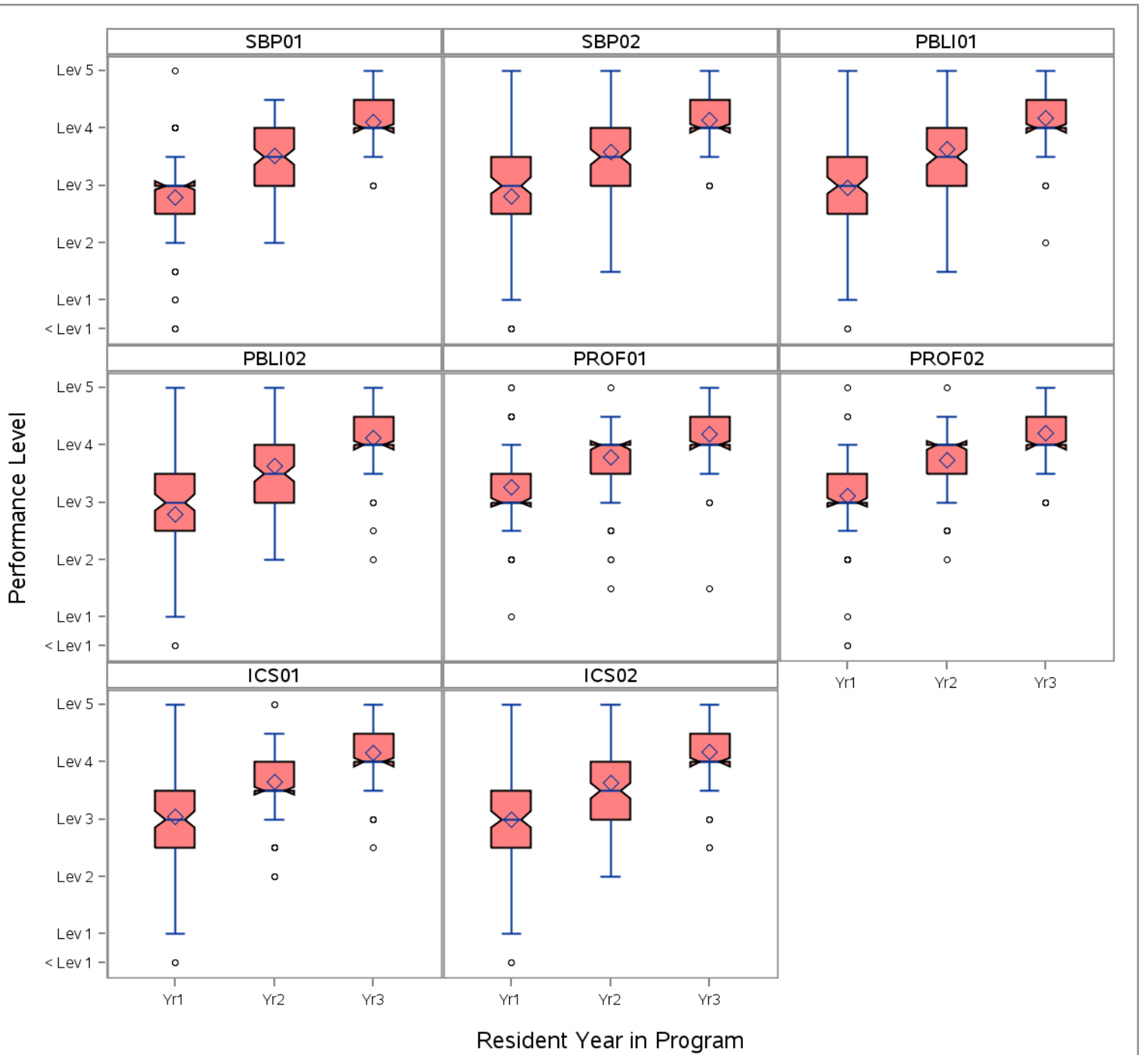
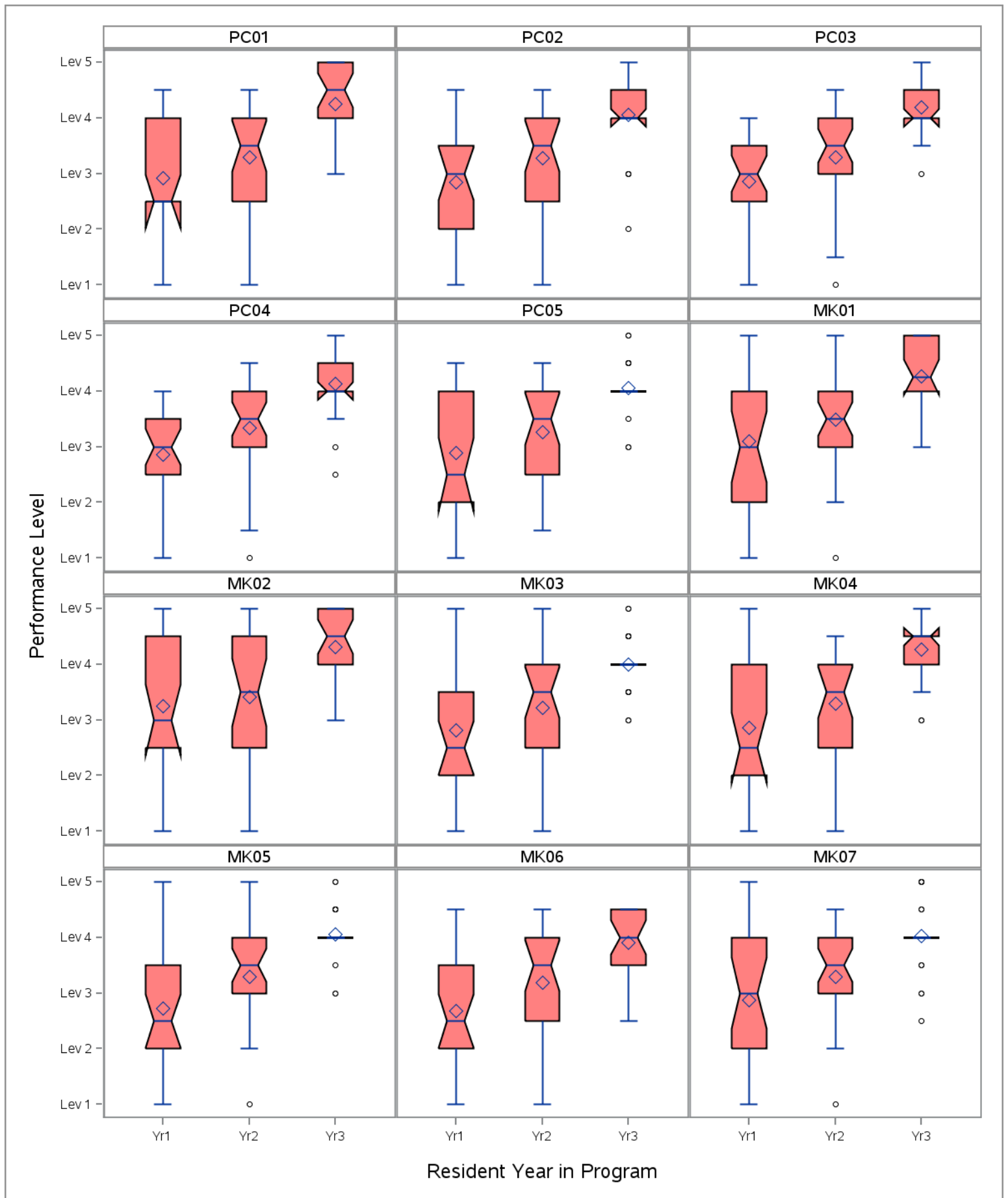


Table 55 - Nuclear medicine (June 2017)



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Table 55 - Nuclear medicine (June 2017)

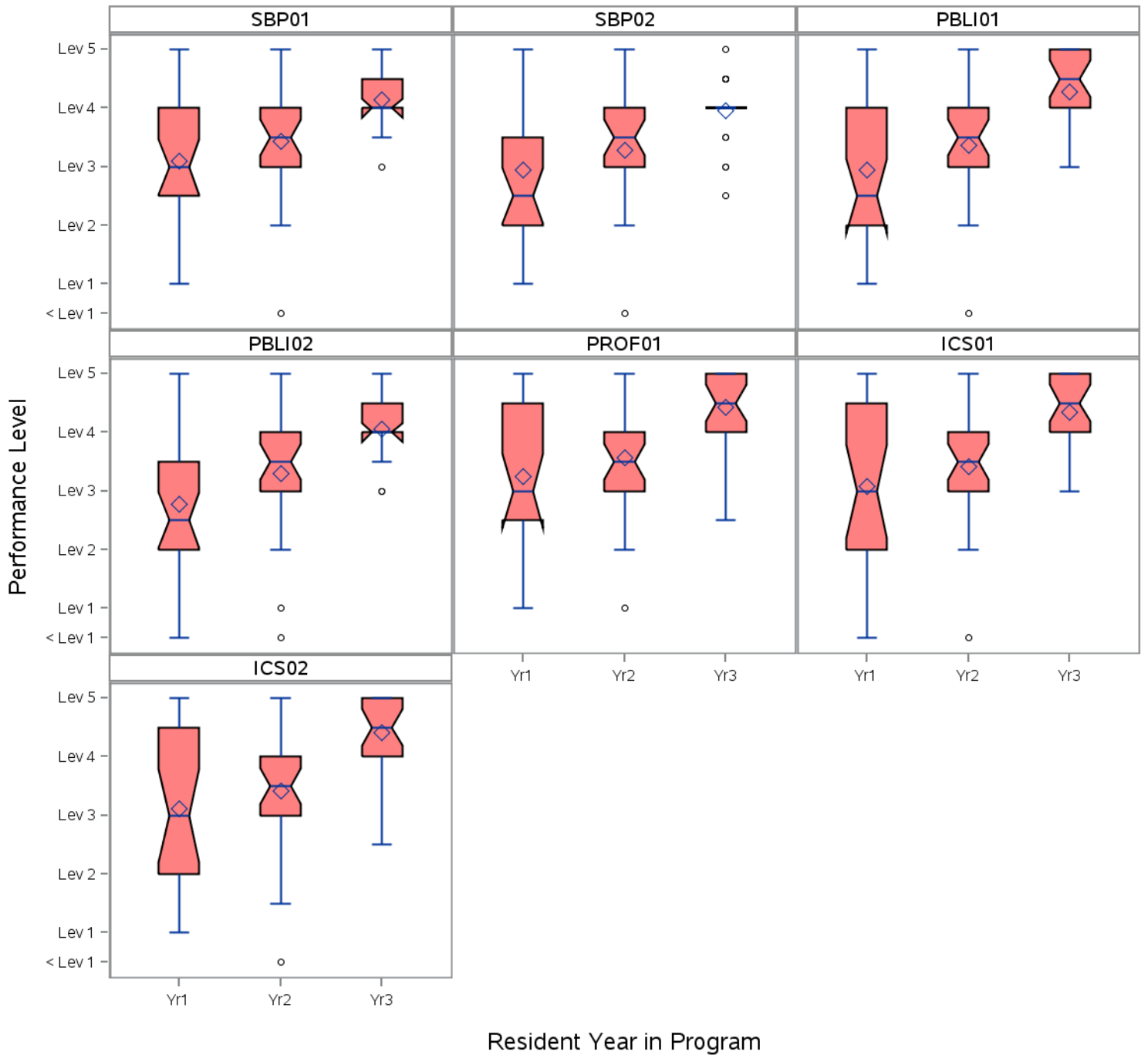
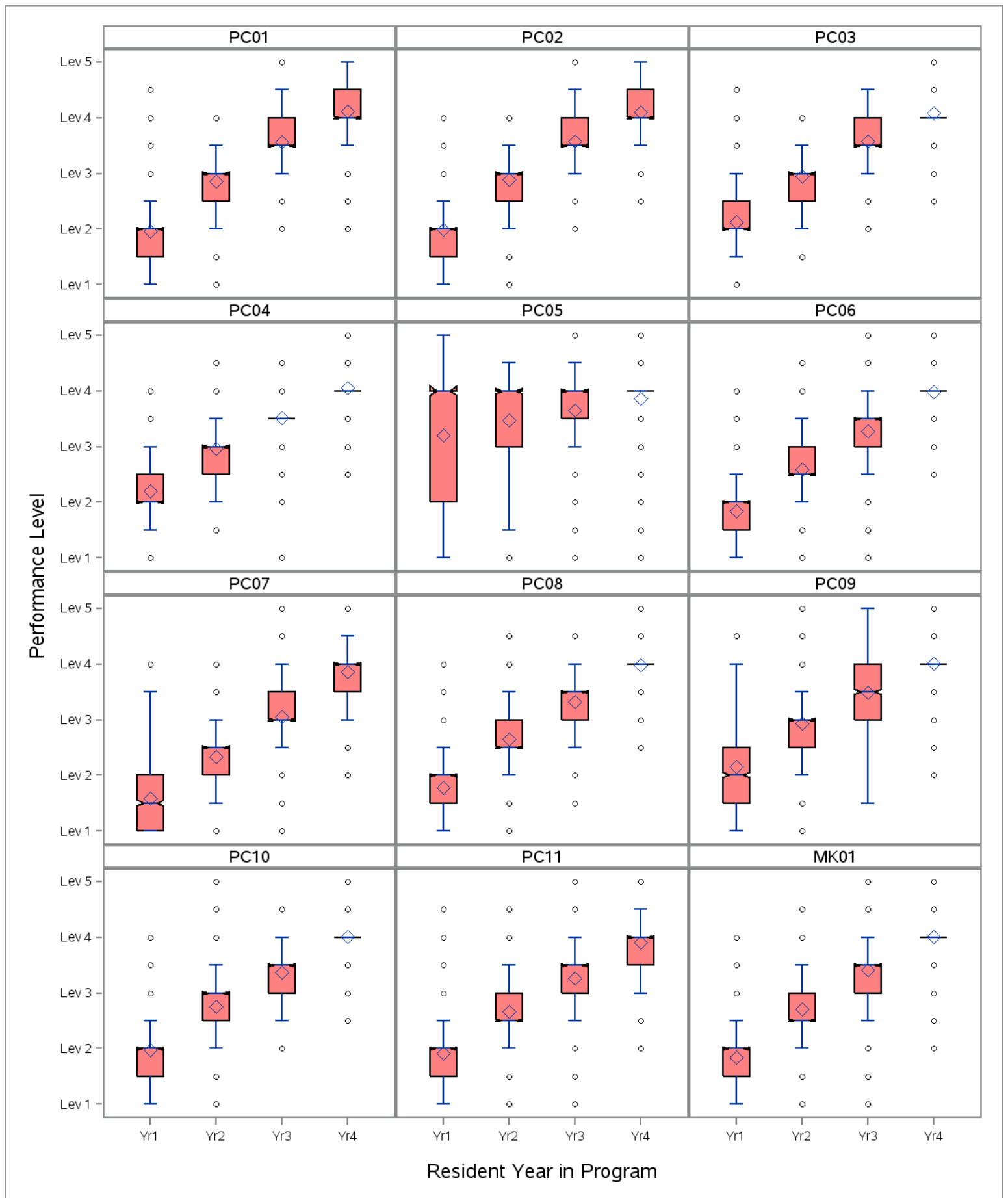
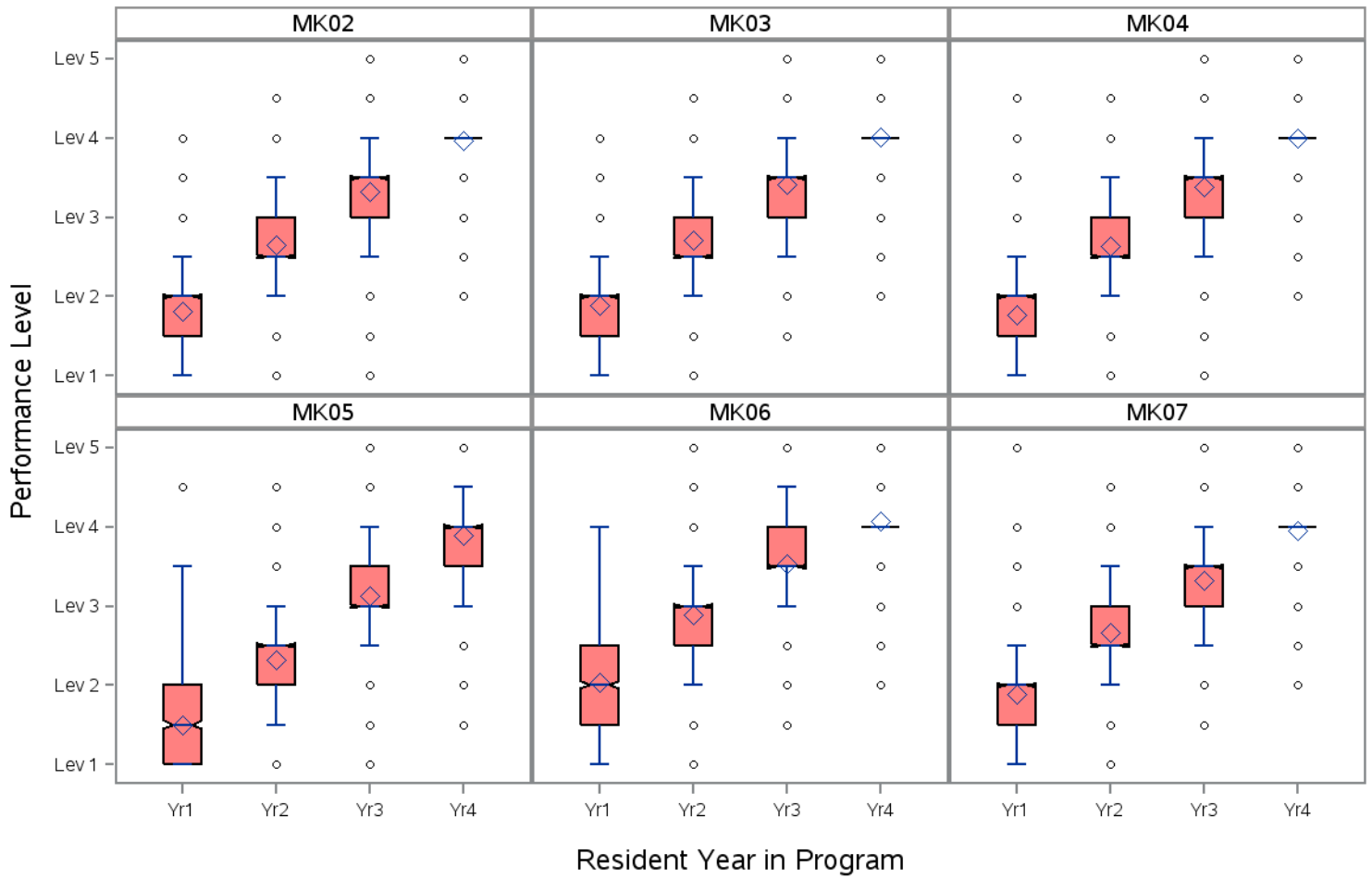


Table 56 - Obstetrics and gynecology (June 2017)



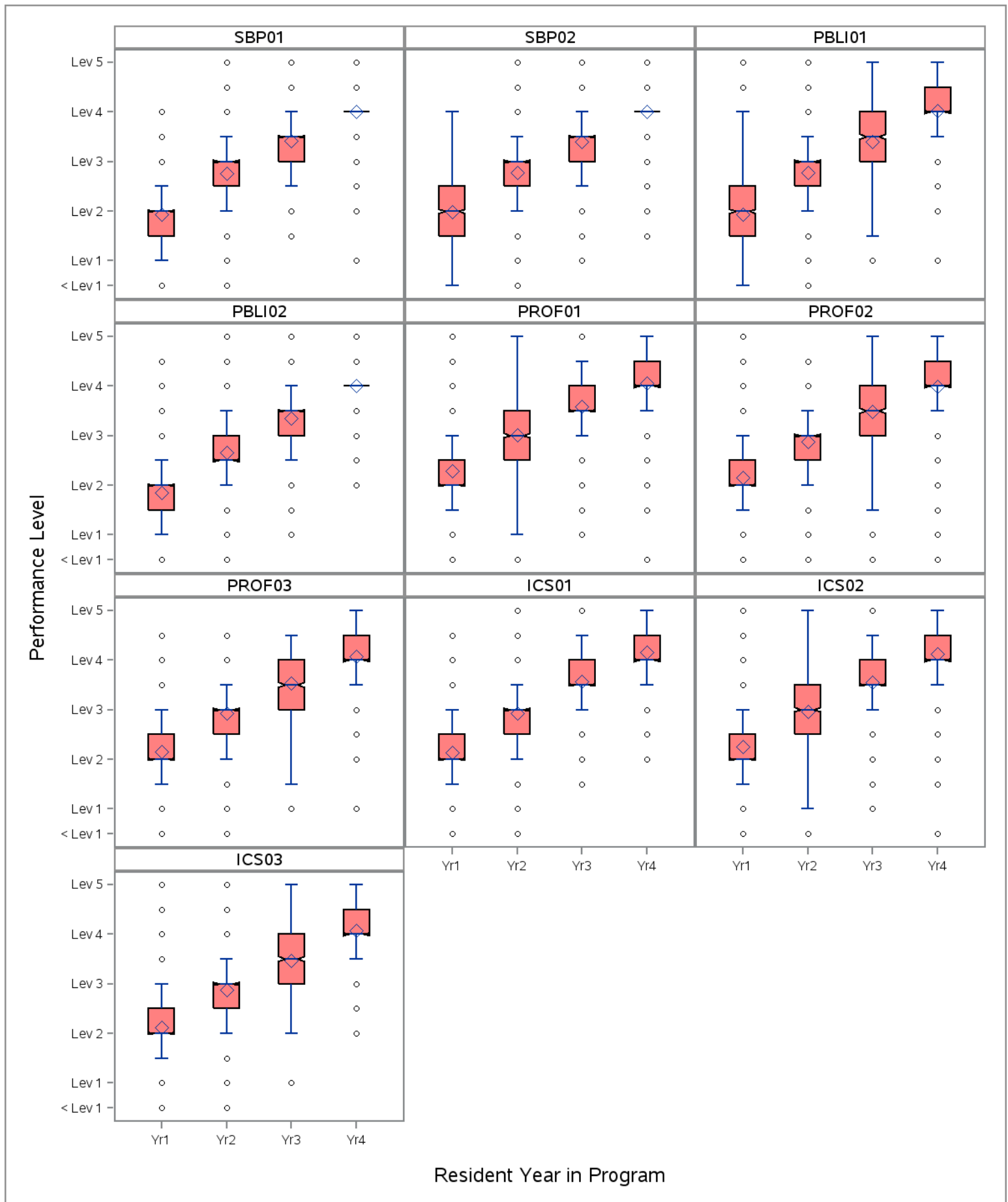
Continue to next page for Obstetrics and gynecology

Table 56 - Obstetrics and gynecology (June 2017)



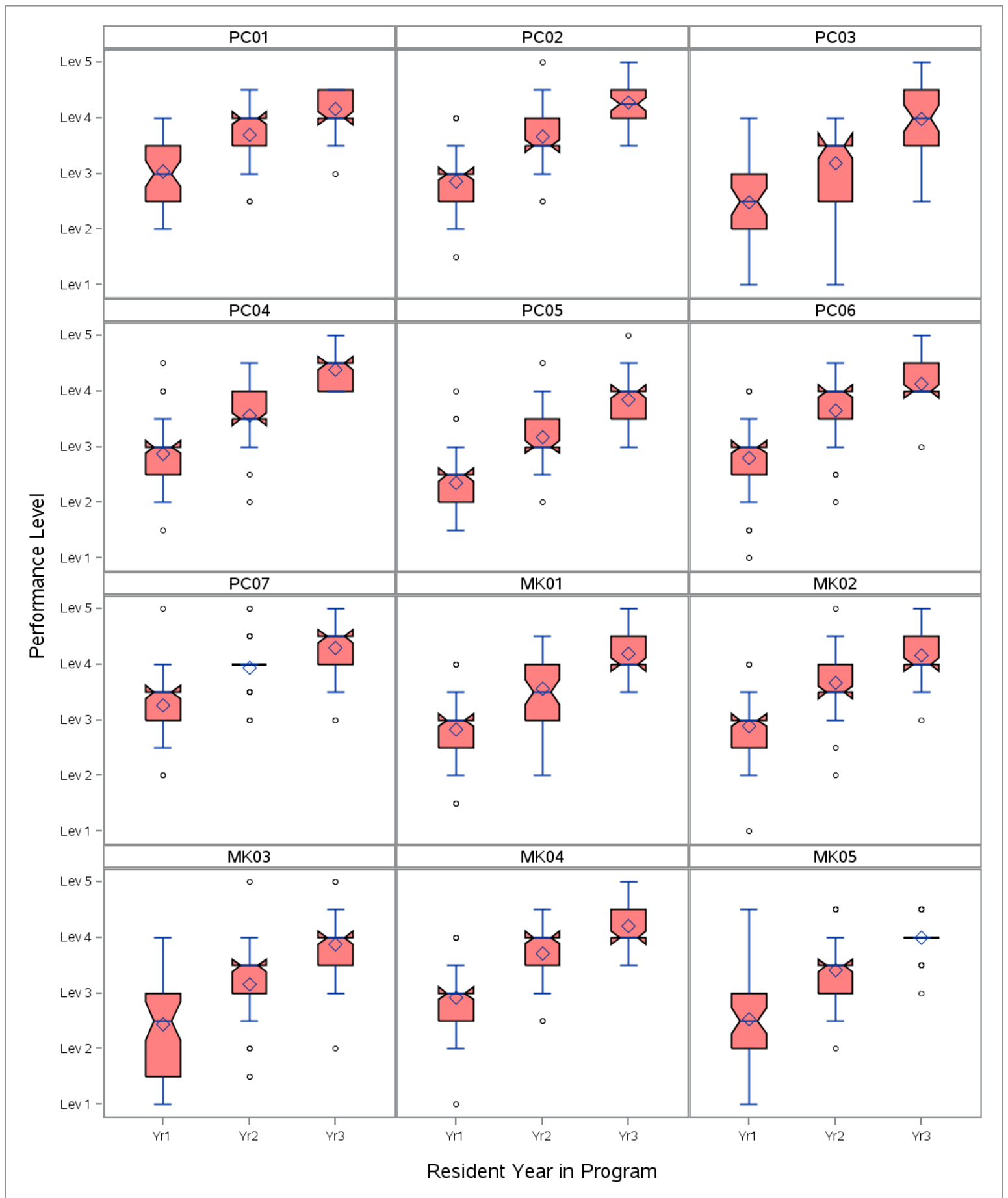
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Table 56 - Obstetrics and gynecology (June 2017)



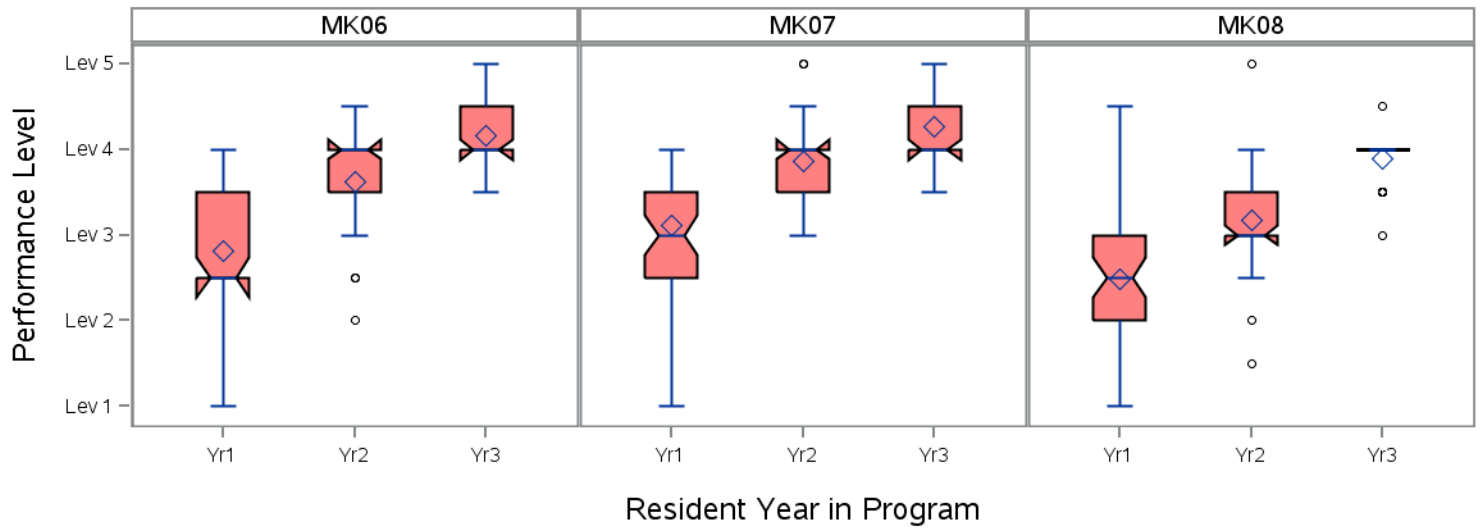
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Table 57 - Female pelvic medicine and reconstructive surgery (June 2017)



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Table 57 - Female pelvic medicine and reconstructive surgery (June 2017)



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Table 57 - Female pelvic medicine and reconstructive surgery (June 2017)

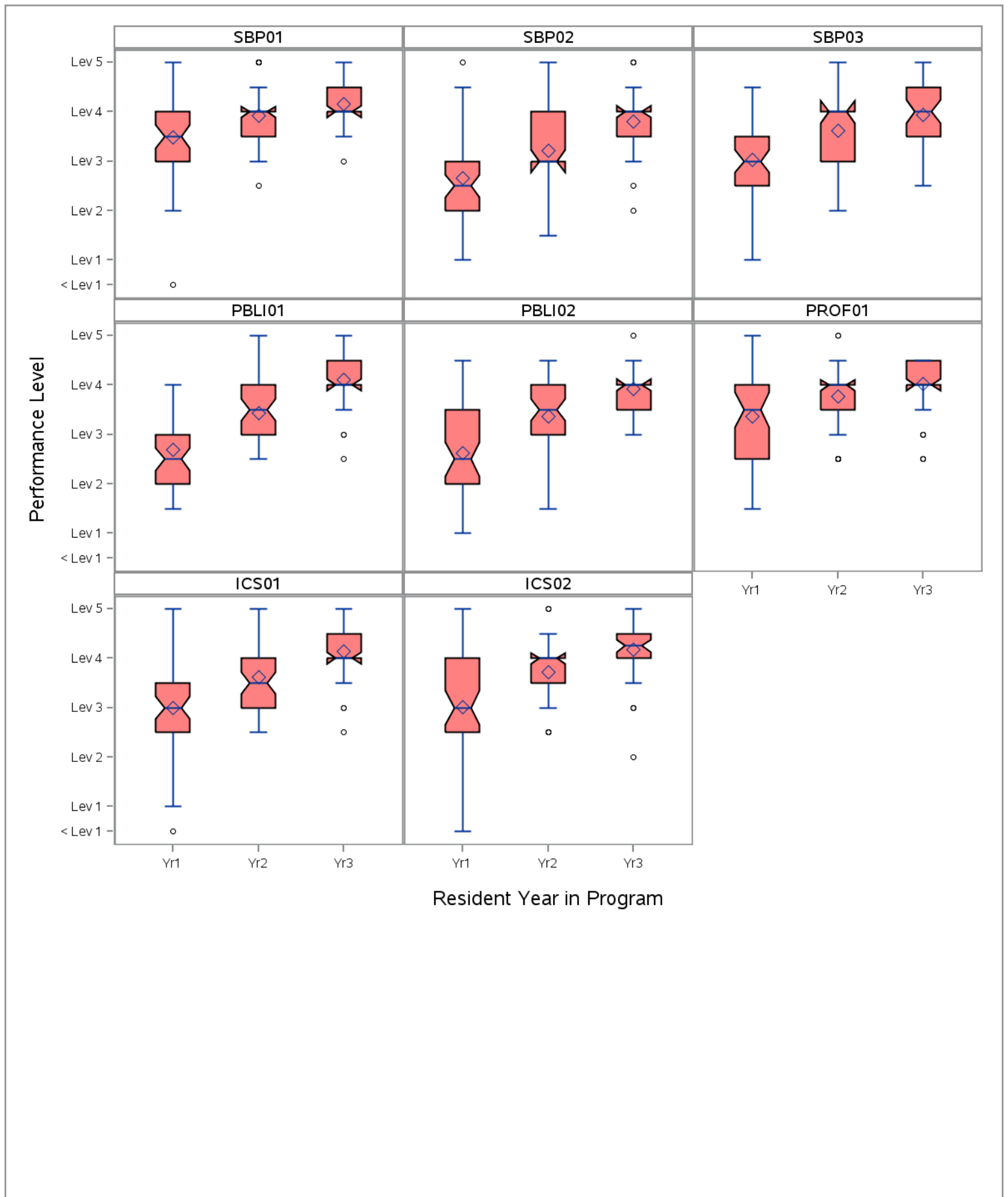
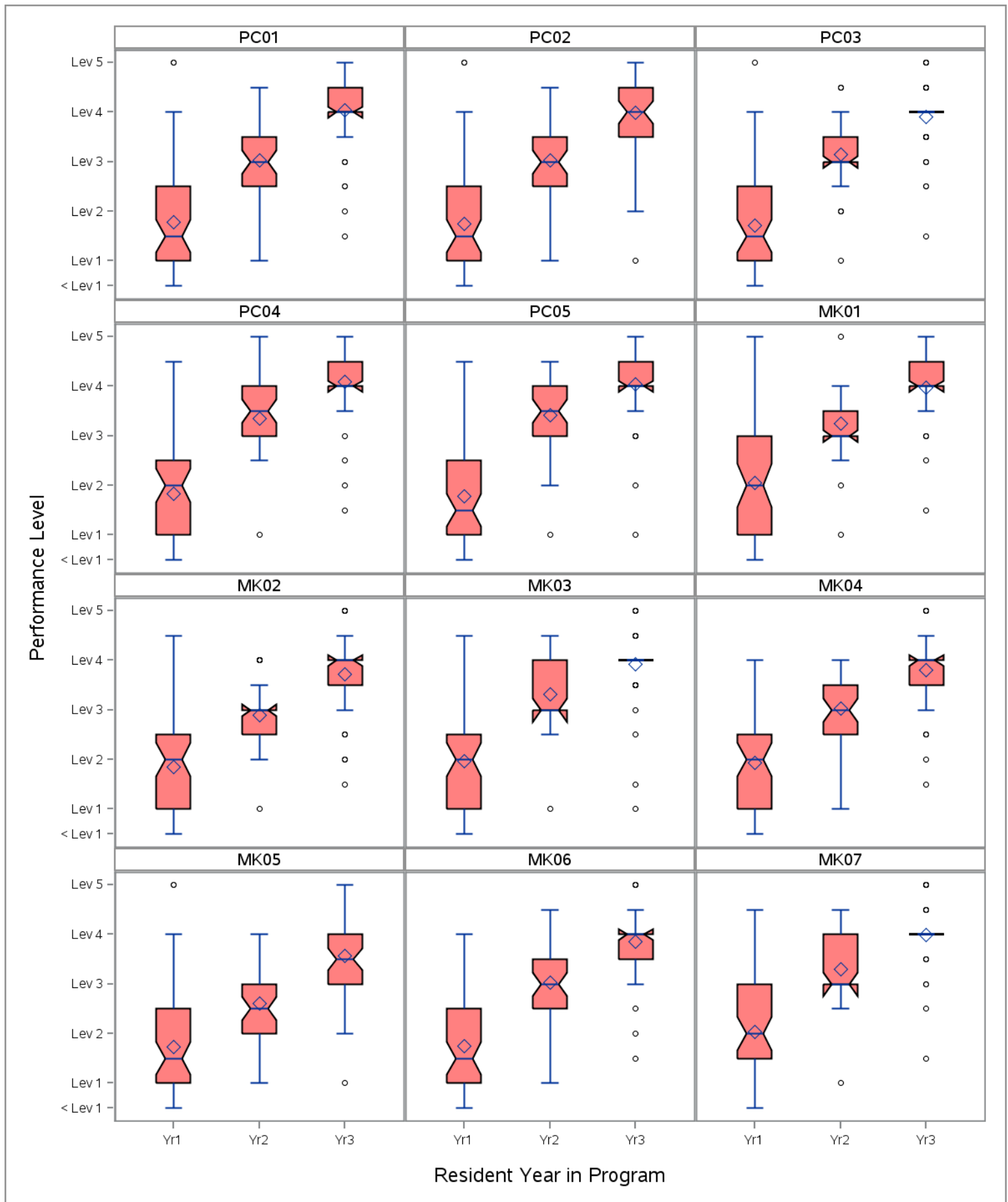


Table 58 - Gynecologic oncology (June 2017)



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Table 58 - Gynecologic oncology (June 2017)

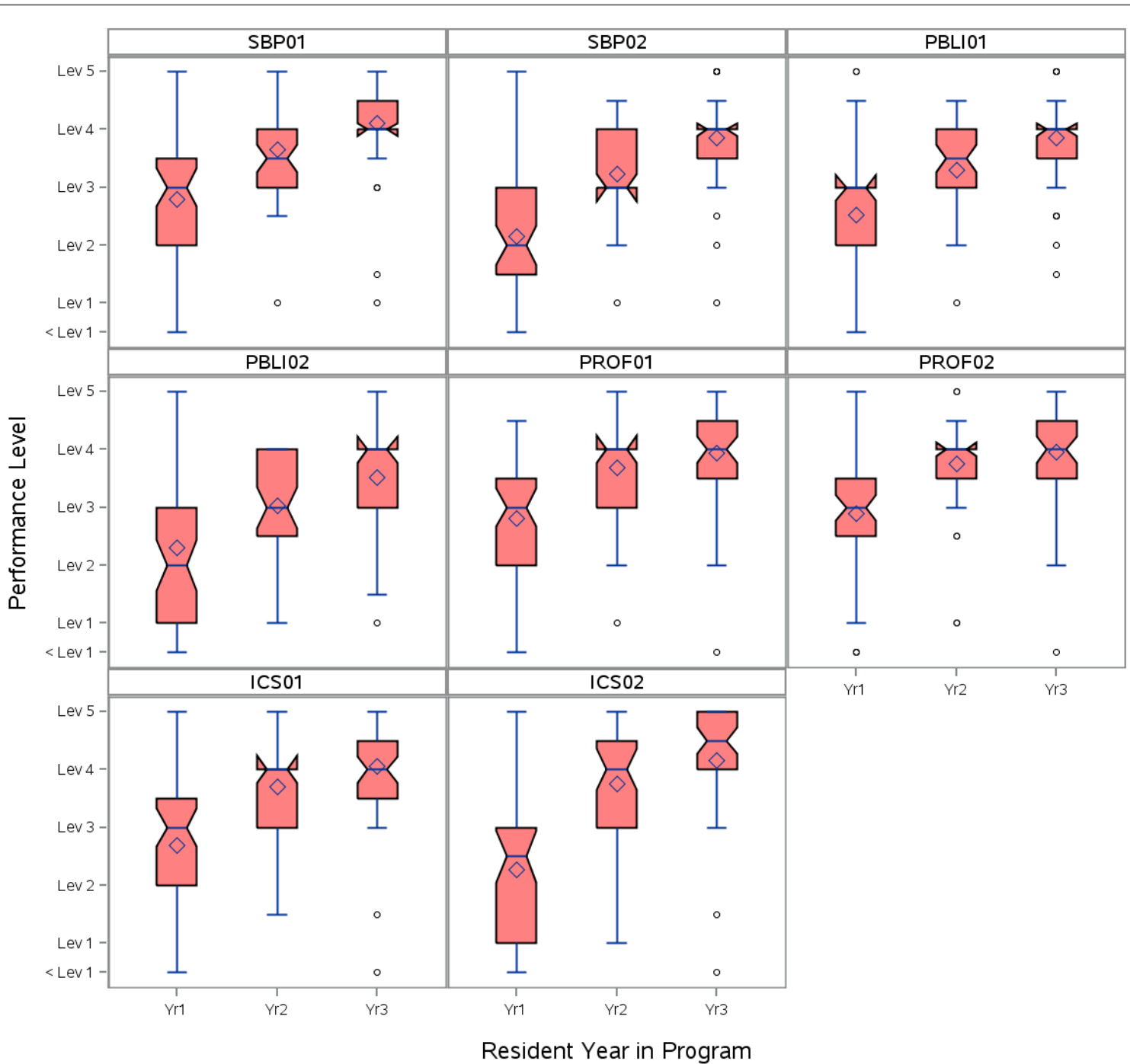
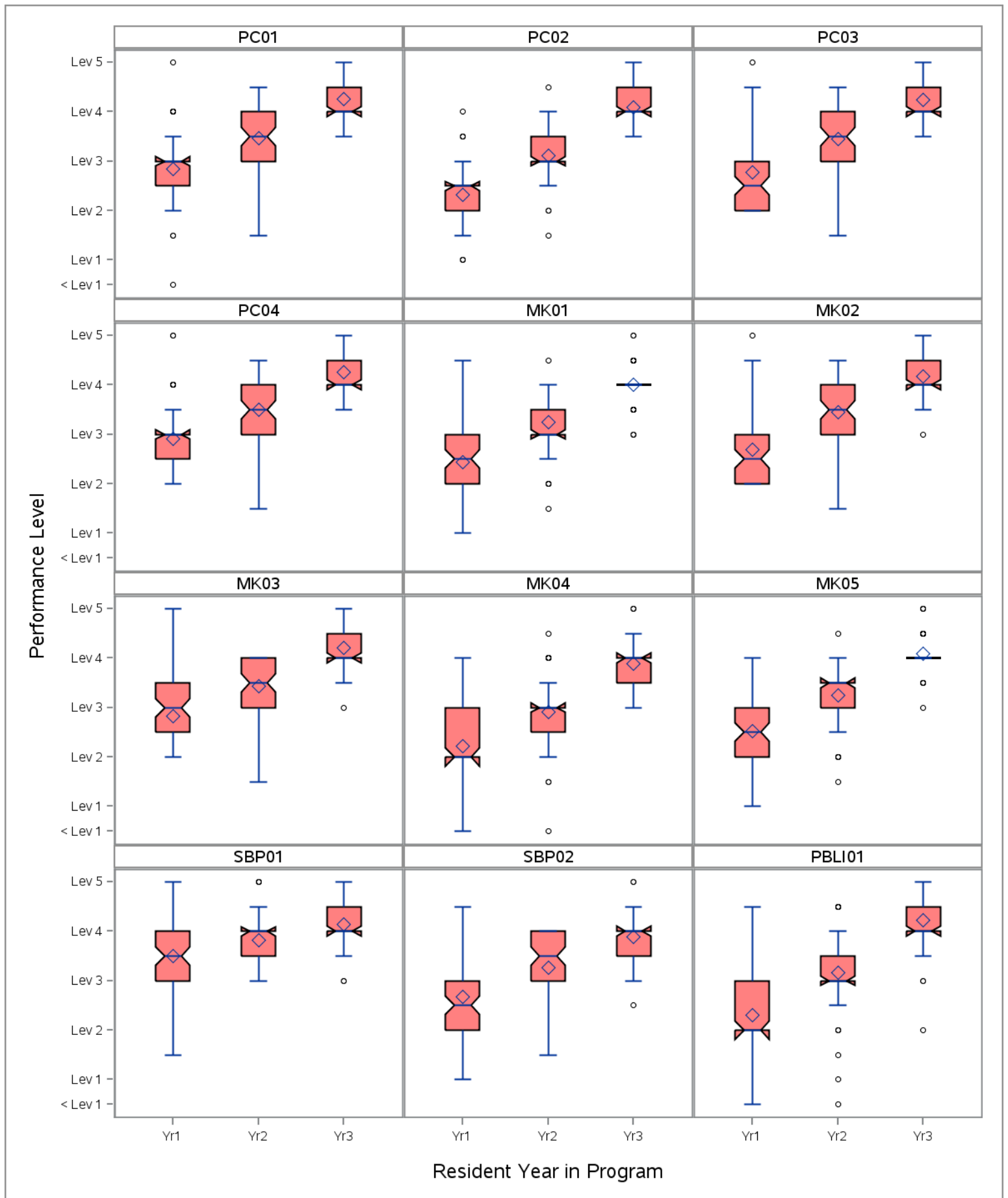


Table 59 - Maternal-fetal medicine (June 2017)



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Table 59 - Maternal-fetal medicine (June 2017)

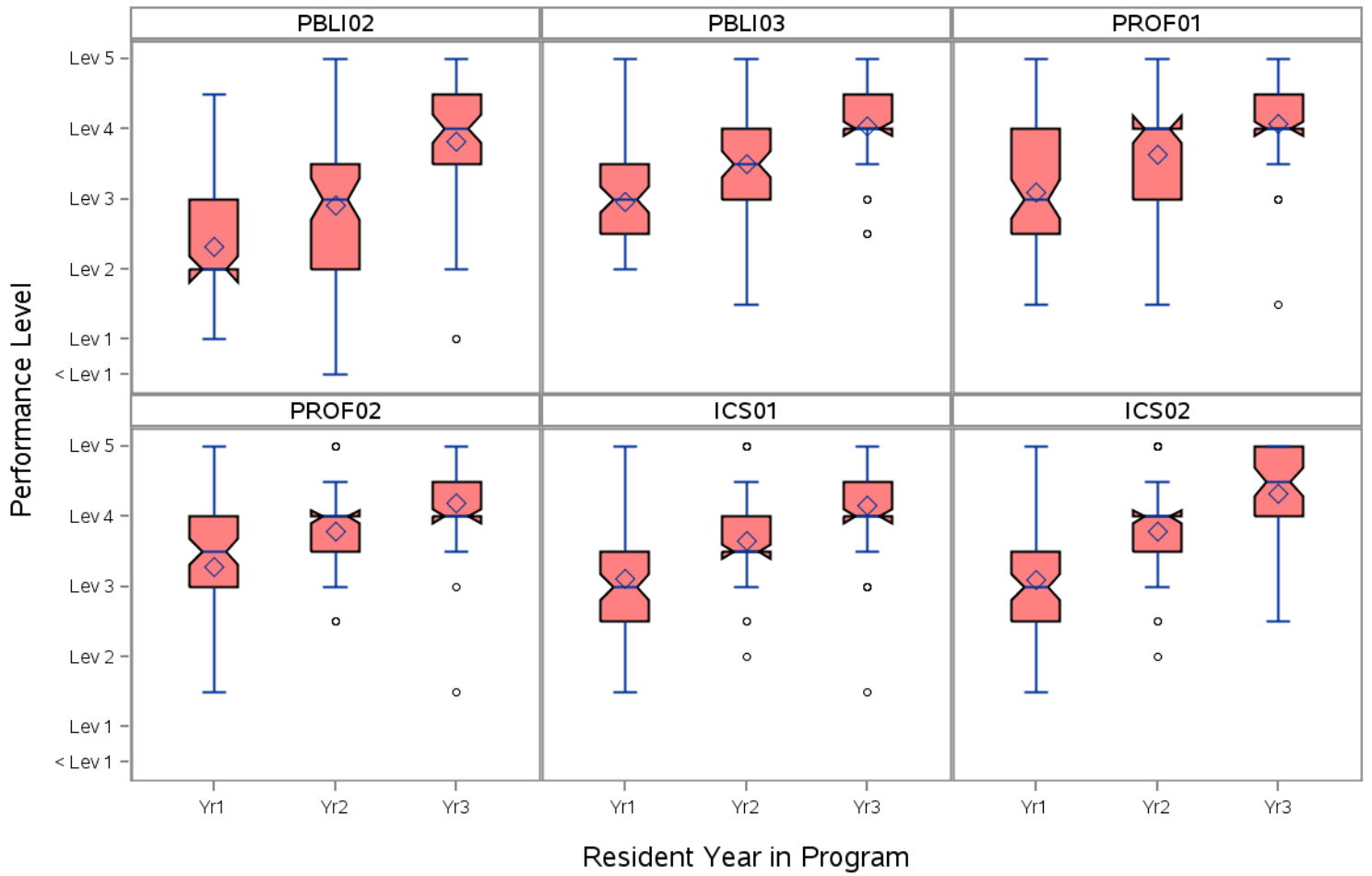
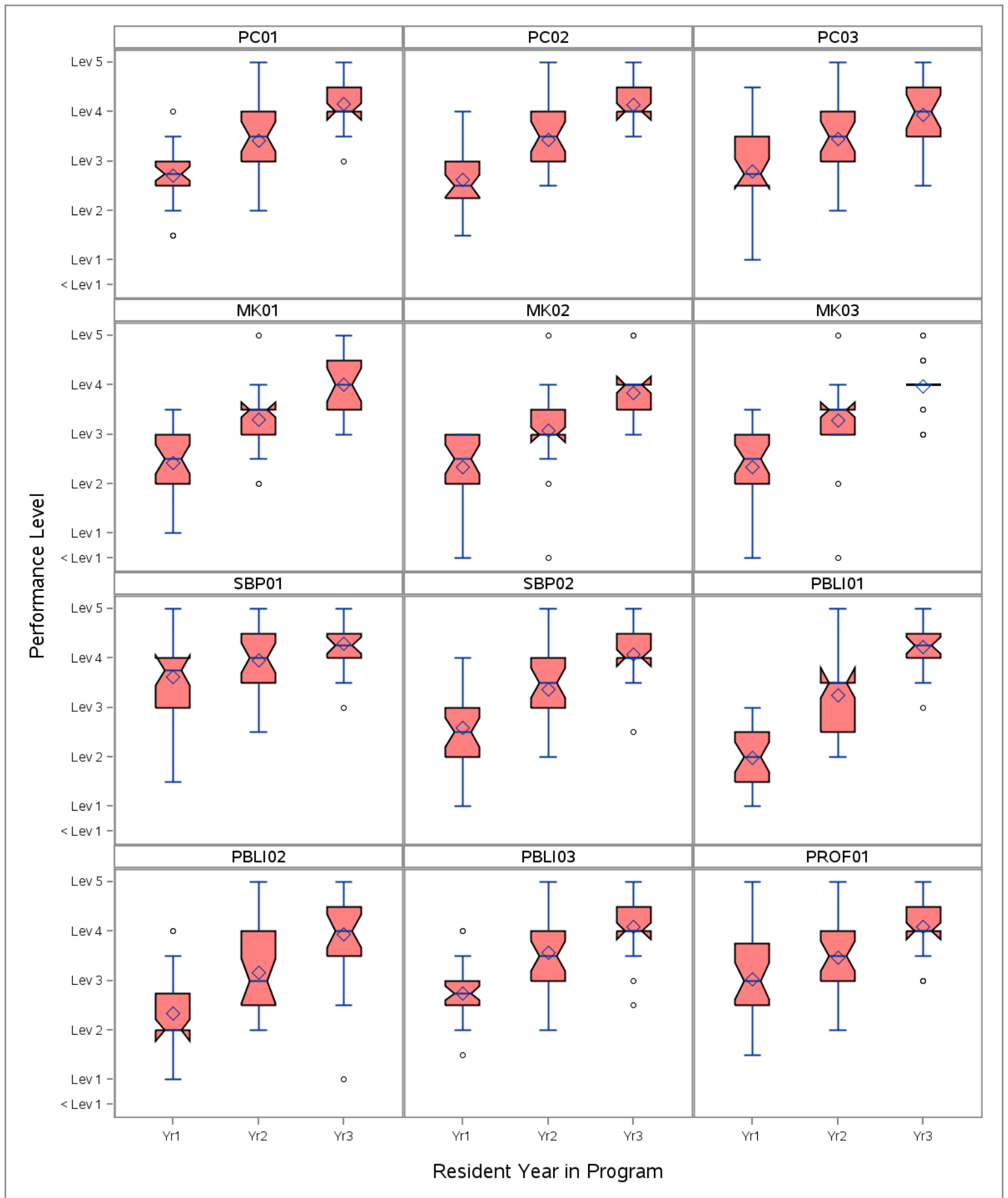


Table 60 - Reproductive endocrinology and infertility (June 2017)



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Table 60 - Reproductive endocrinology and infertility (June 2017)

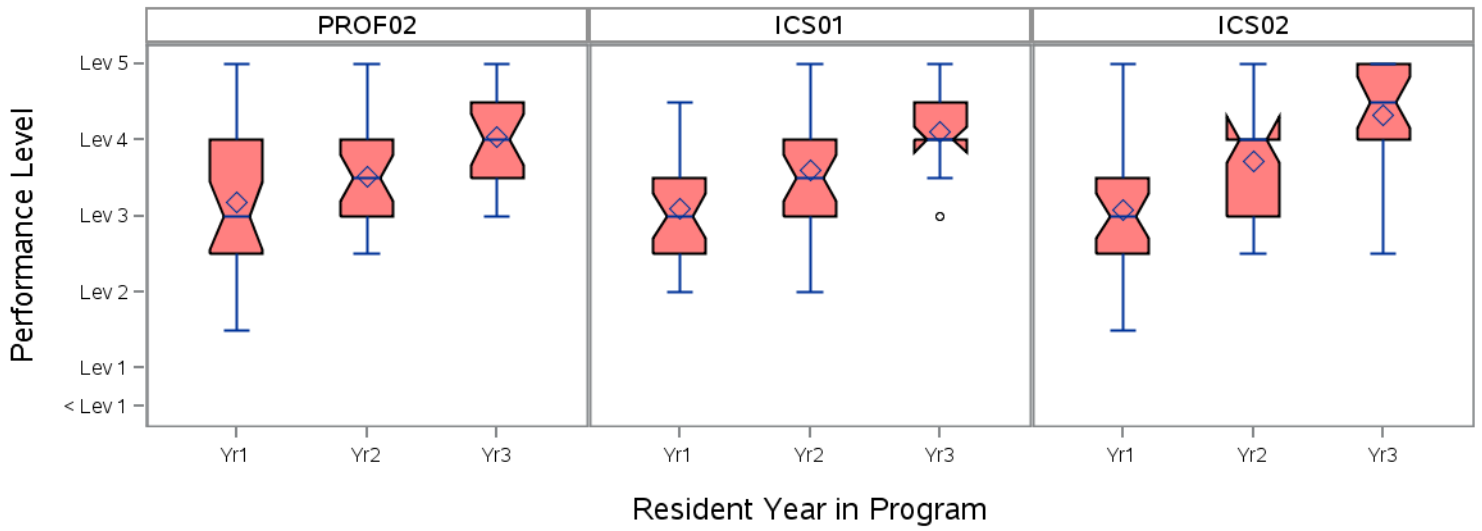
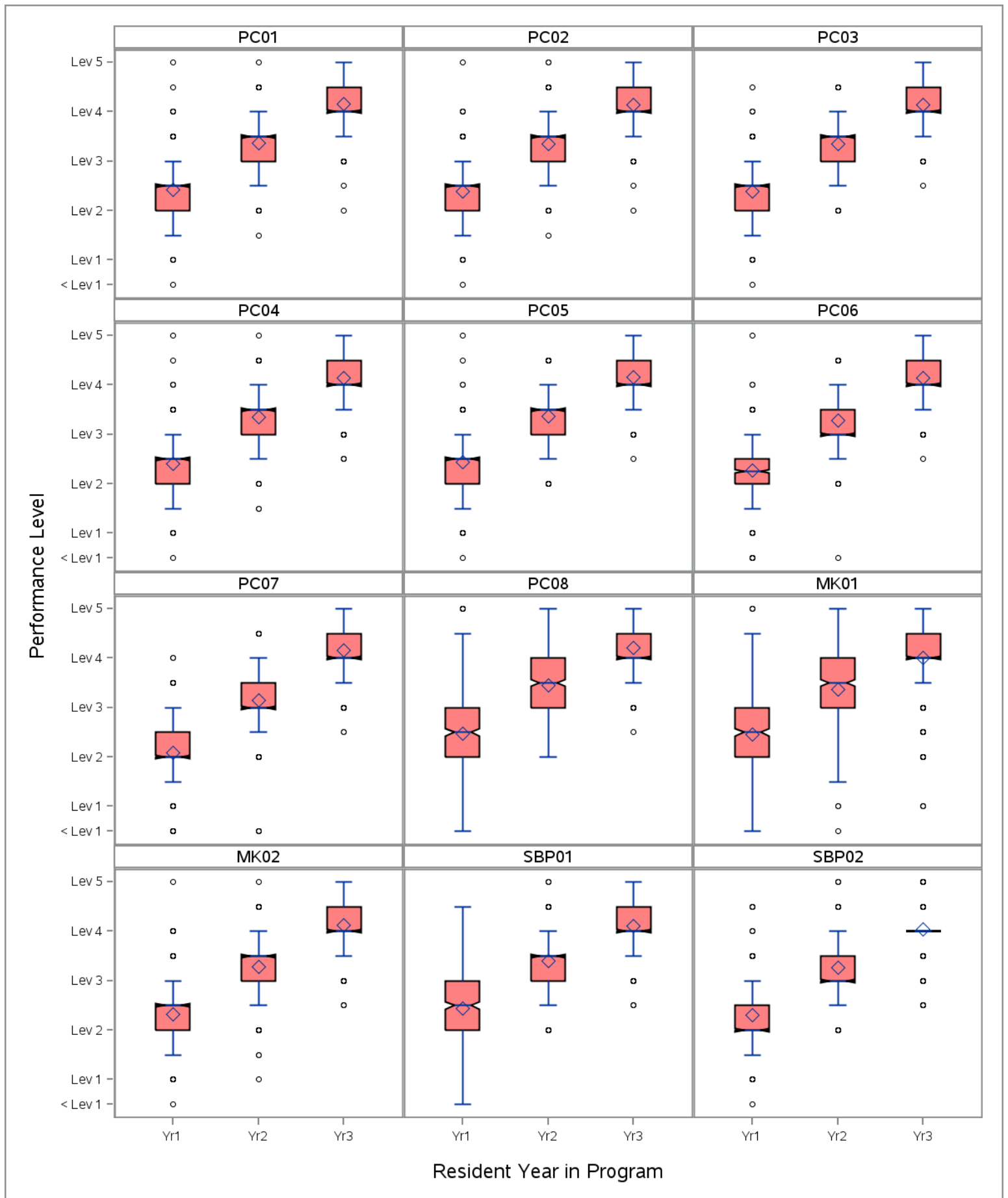
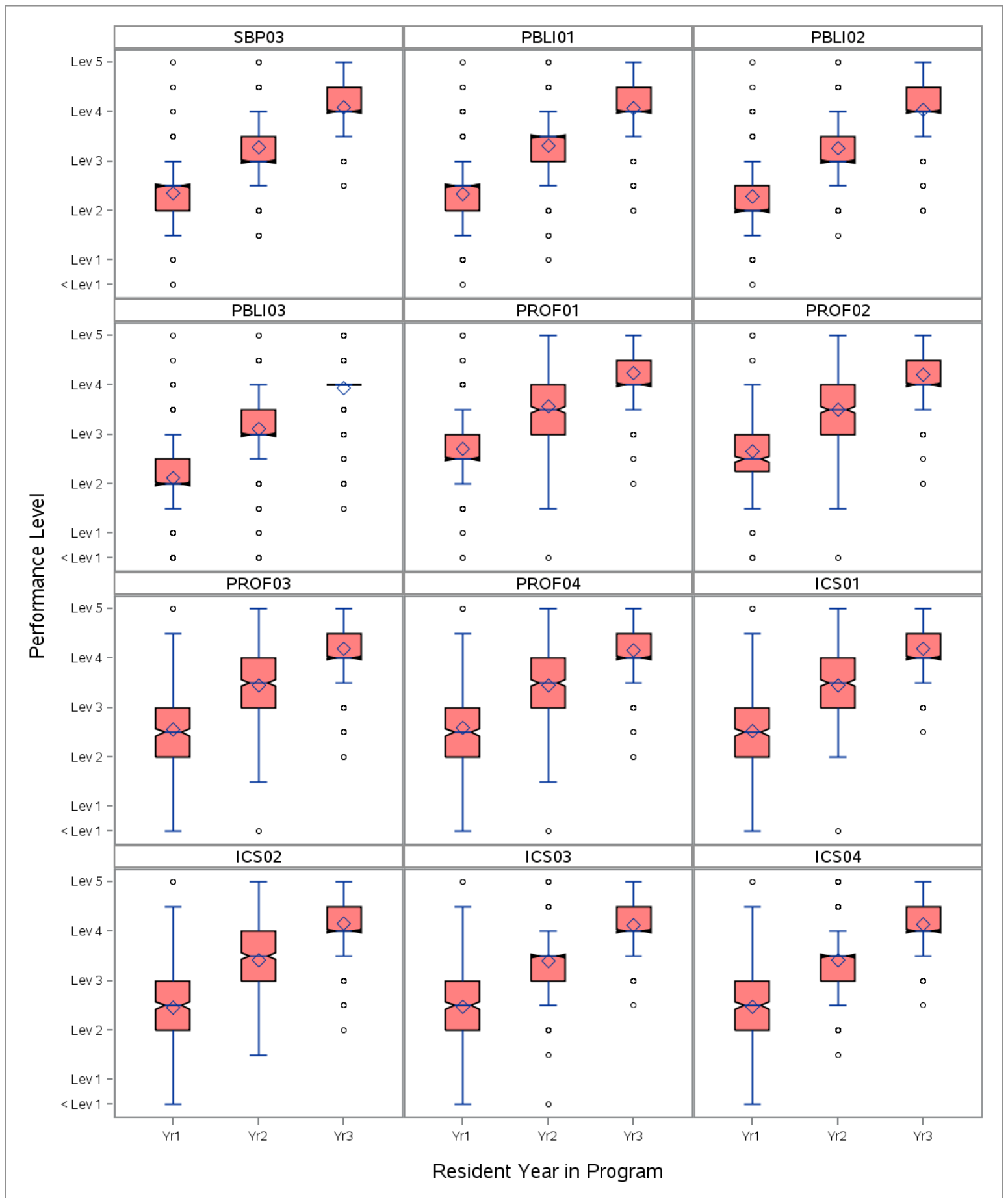


Table 61 - Ophthalmology (June 2017)



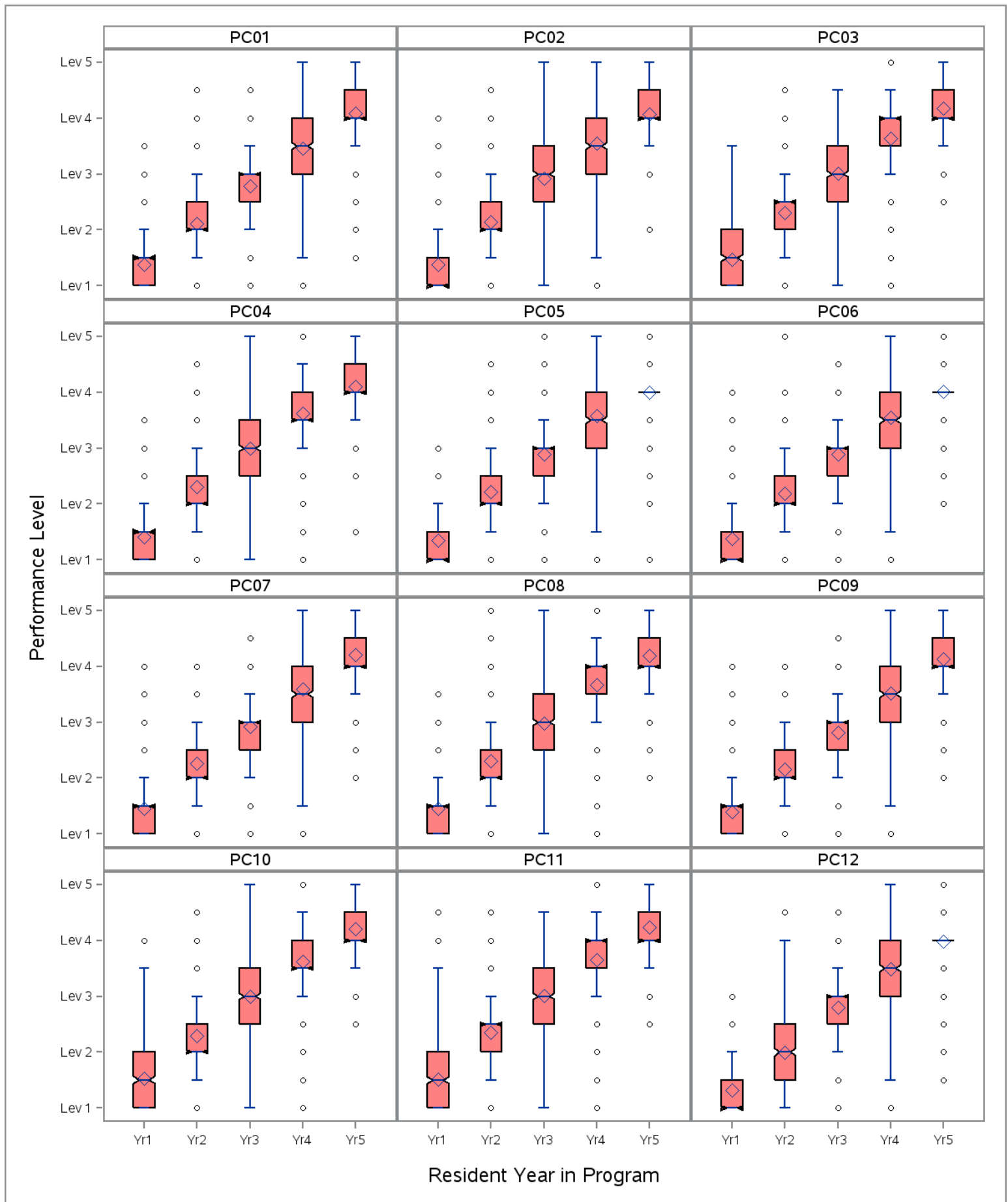
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Table 61 - Ophthalmology (June 2017)



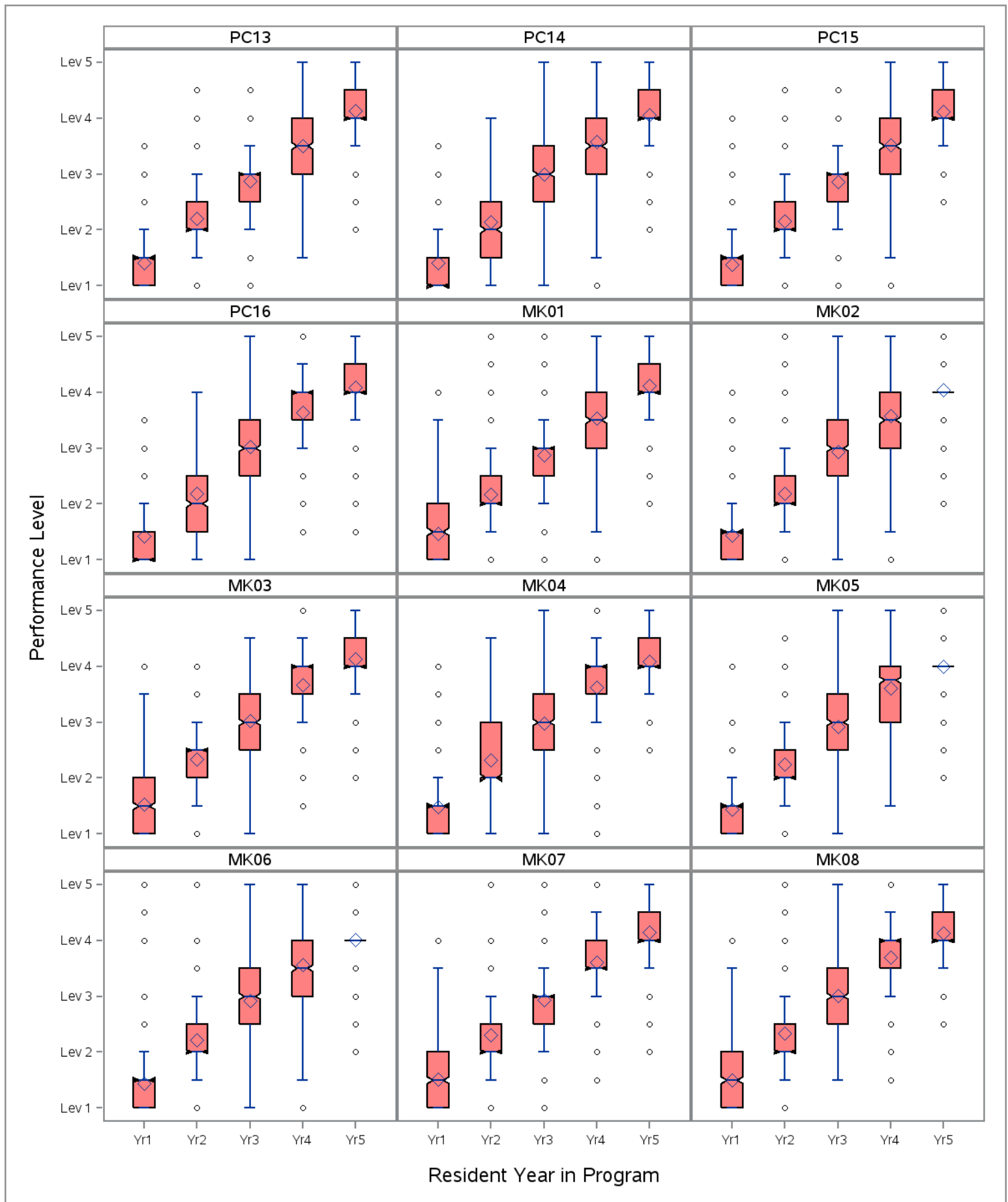
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Table 62 - Orthopaedic surgery (June 2017)



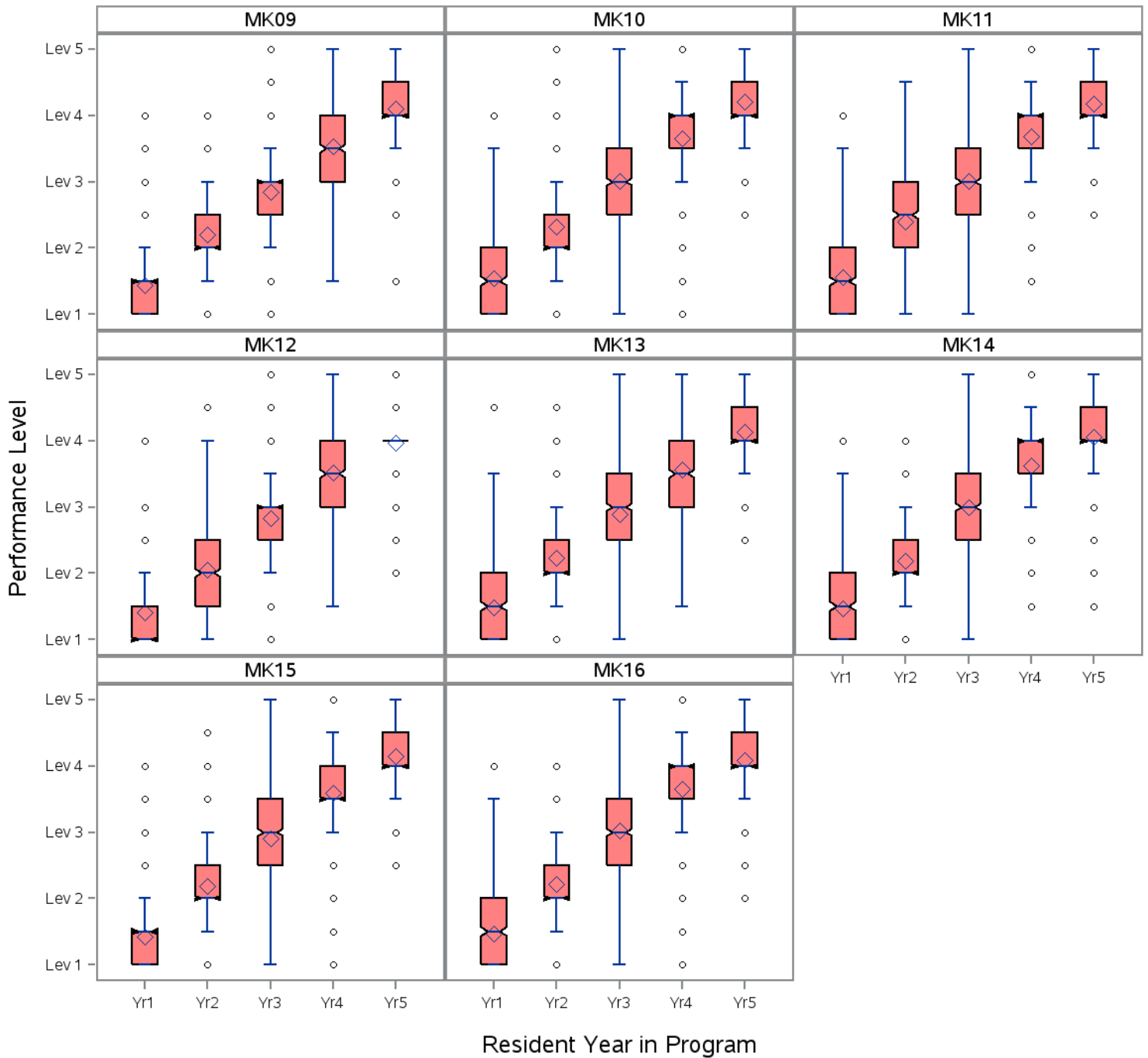
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Table 62 - Orthopaedic surgery (June 2017)



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Table 62 - Orthopaedic surgery (June 2017)



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Table 62 - Orthopaedic surgery (June 2017)

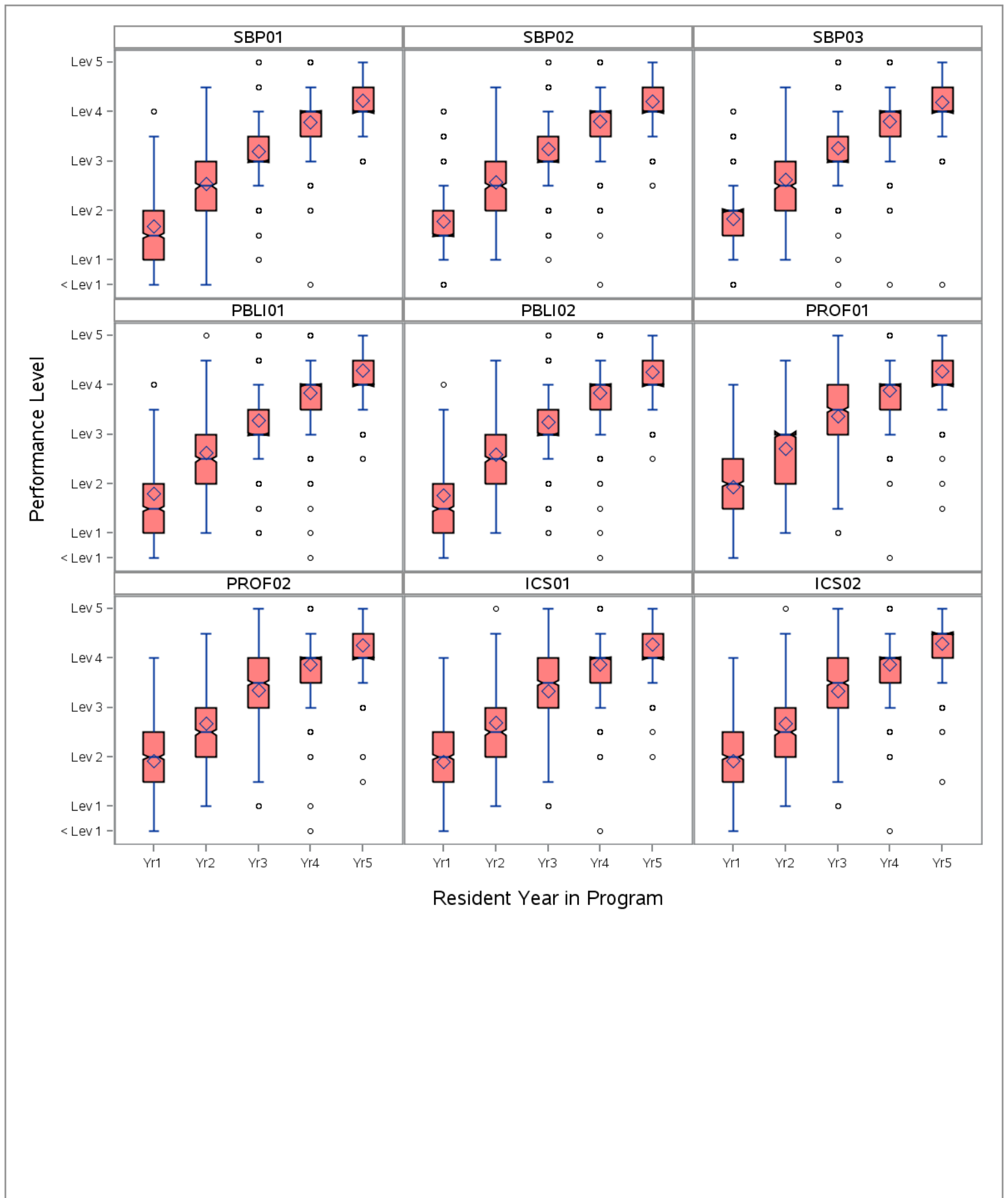
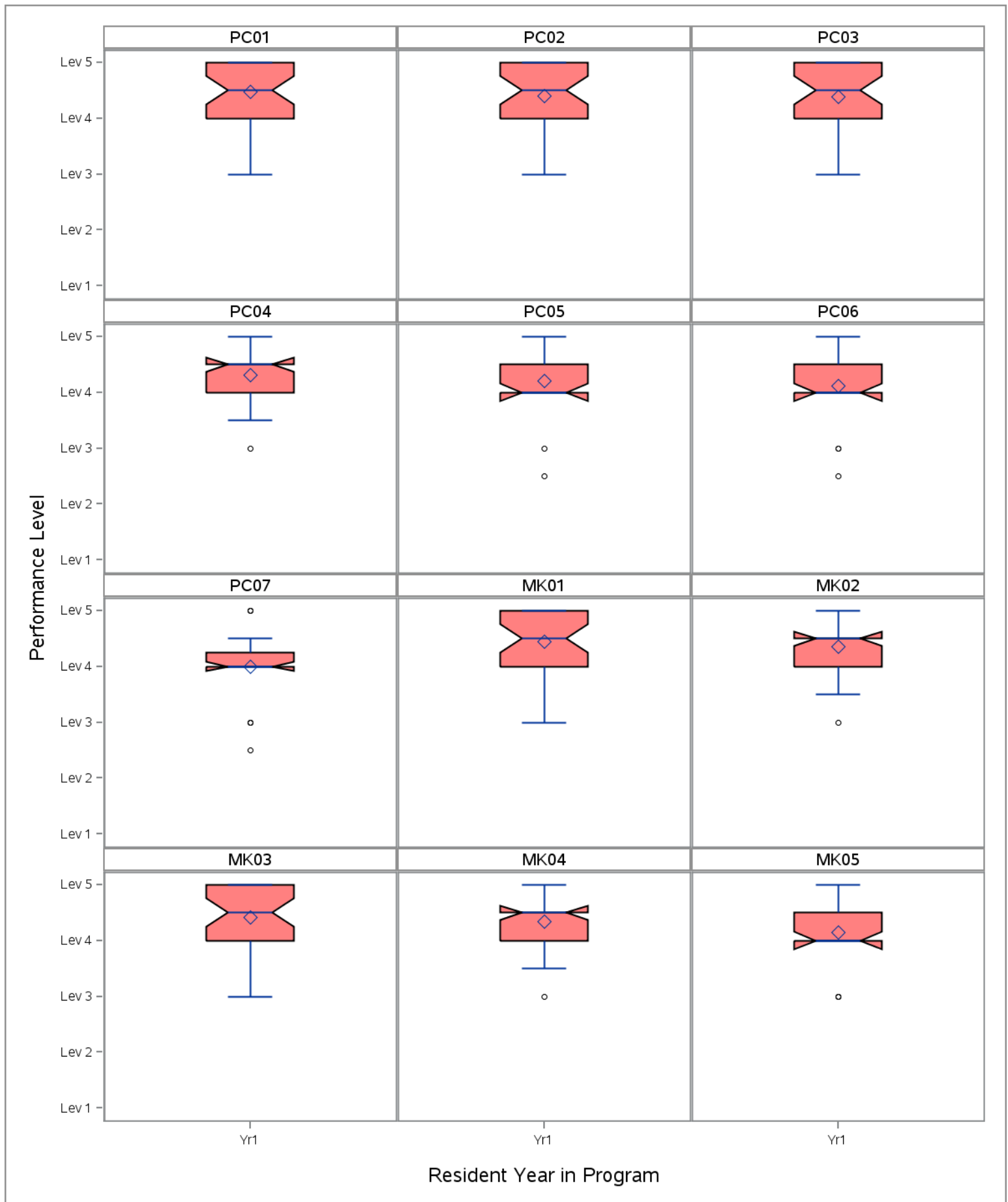


Table 63 - Adult reconstructive orthopaedics (June 2017)



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Table 63 - Adult reconstructive orthopaedics (June 2017)

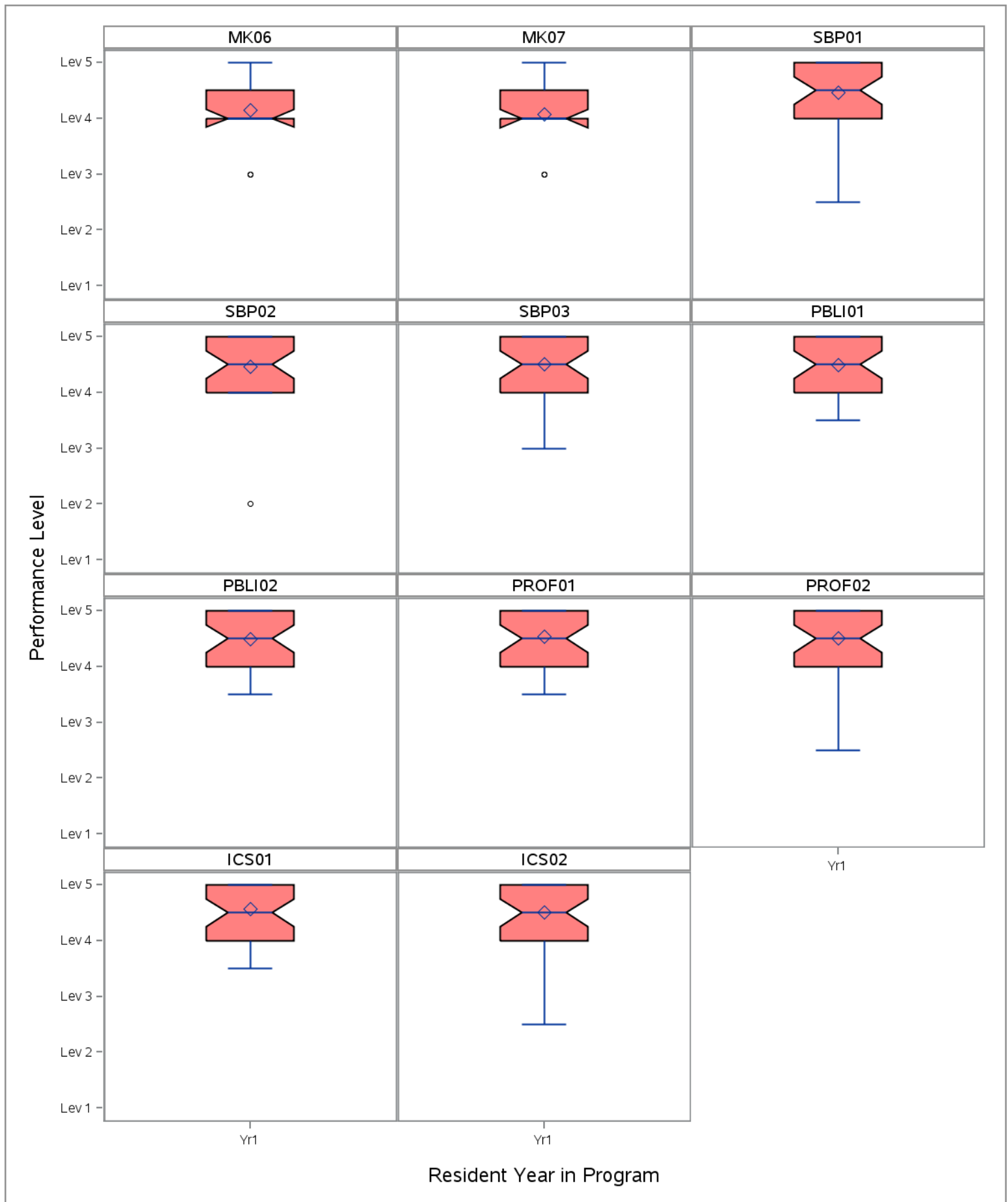
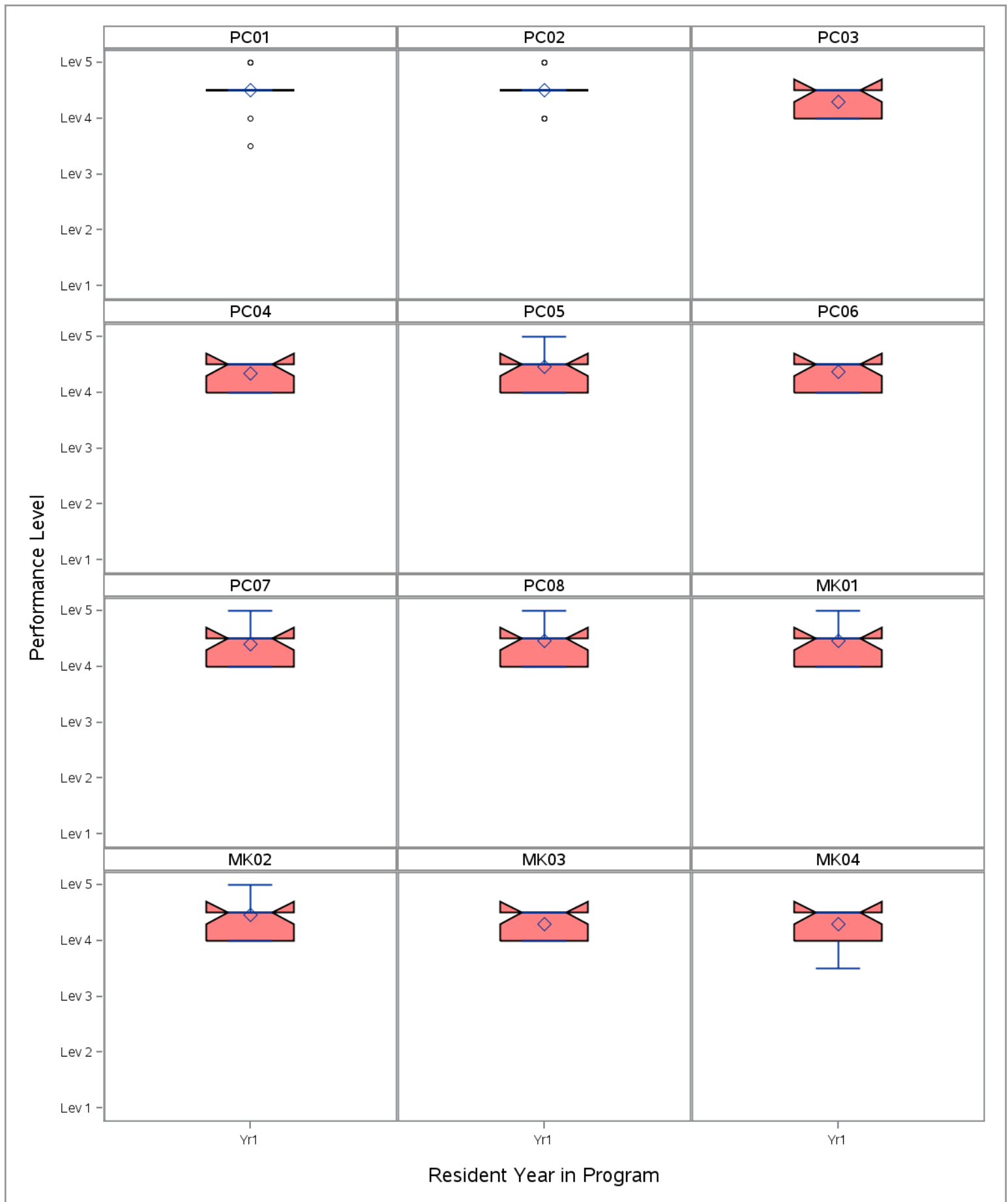


Table 64 - Foot and ankle orthopaedics (June 2017)



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Table 64 - Foot and ankle orthopaedics (June 2017)

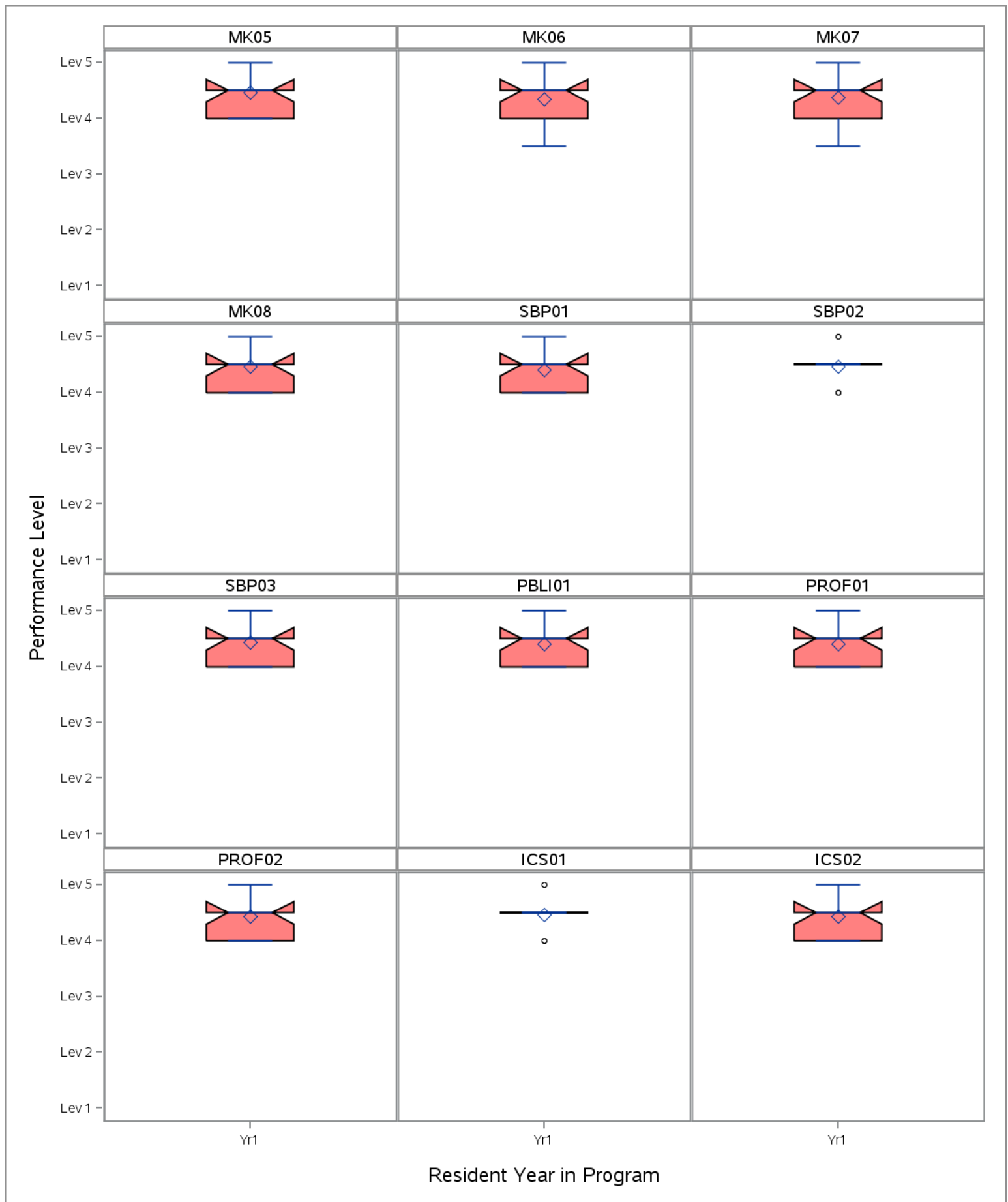
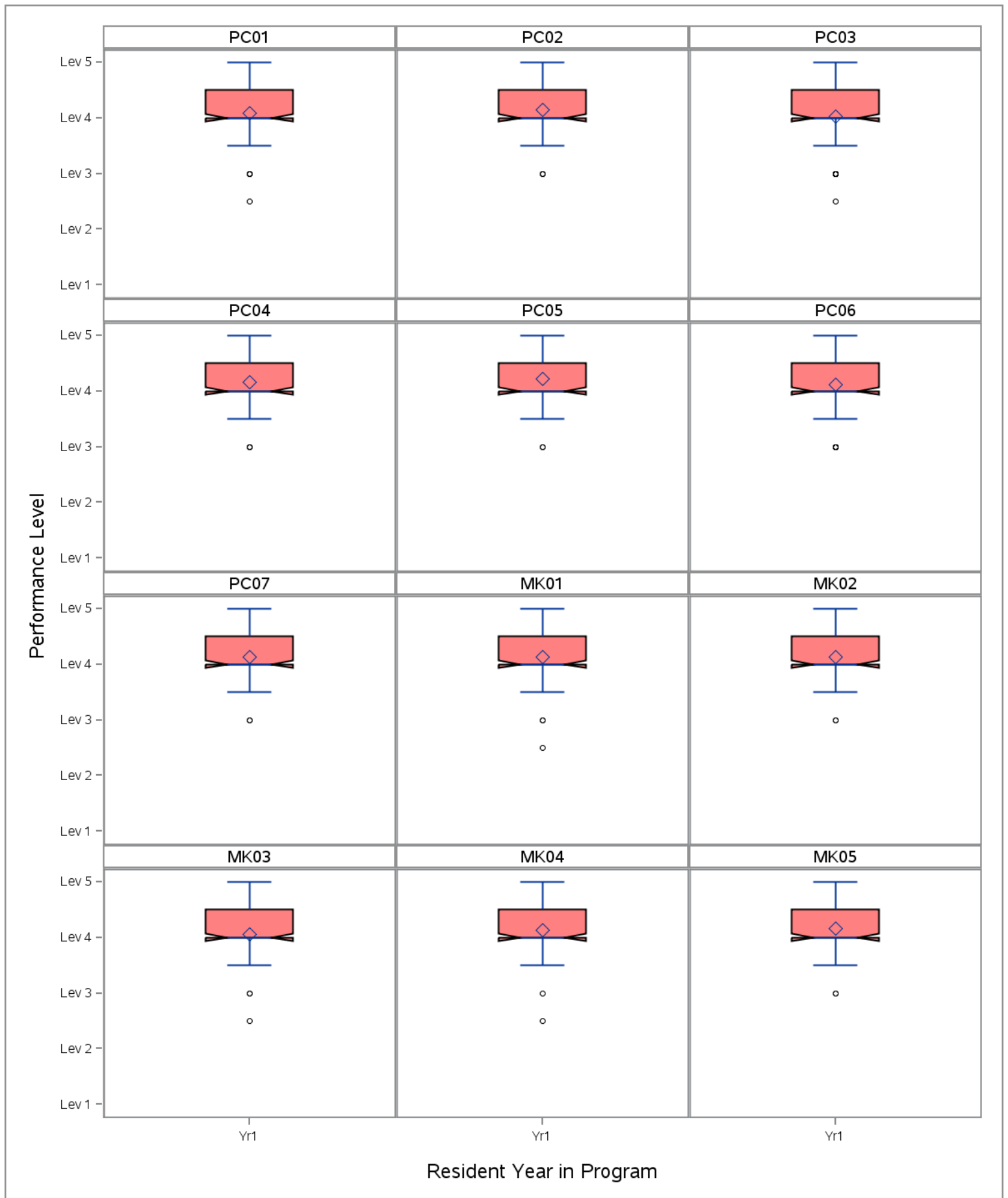


Table 65 - Hand surgery (June 2017)



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Table 65 - Hand surgery (June 2017)

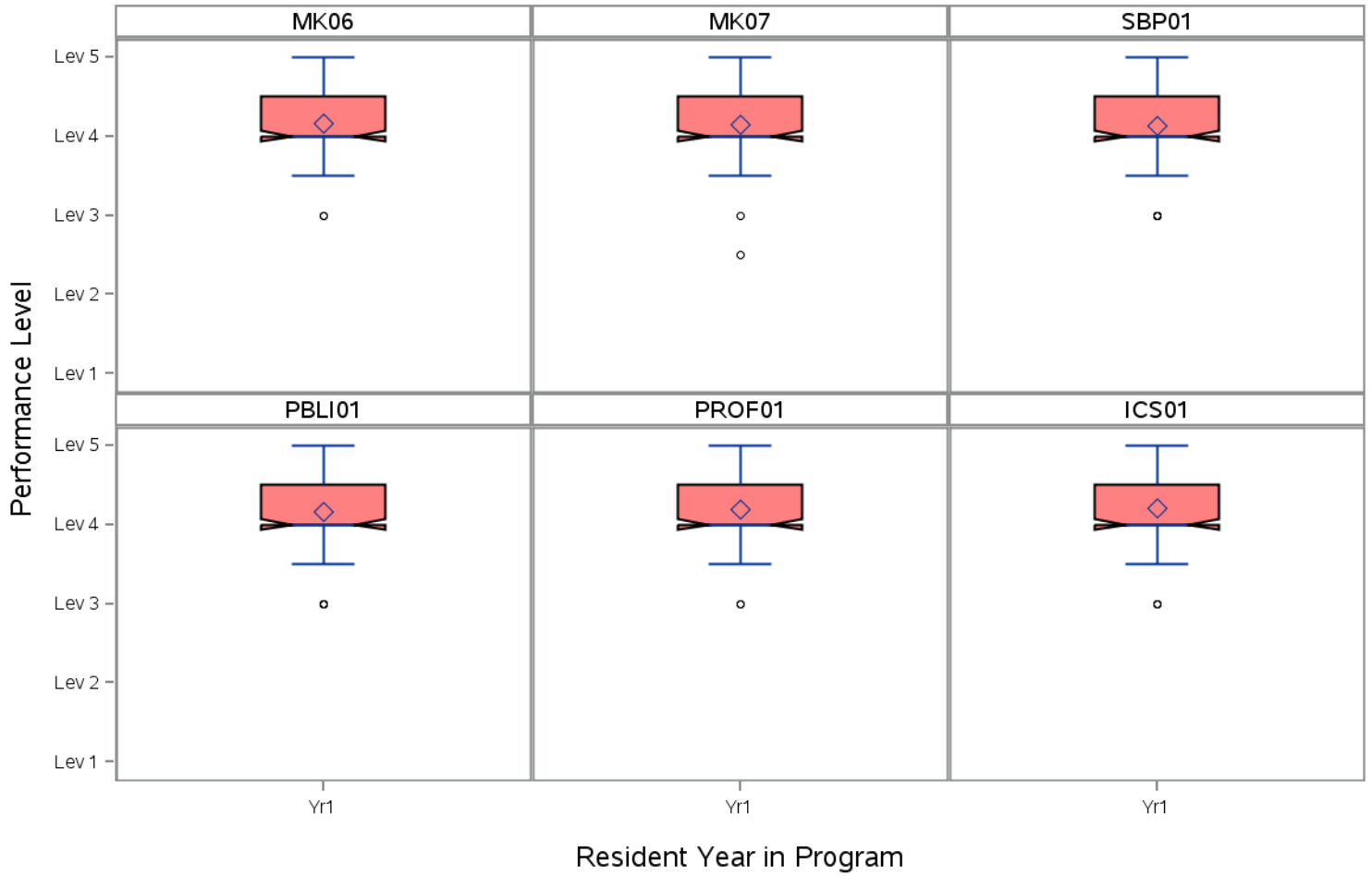
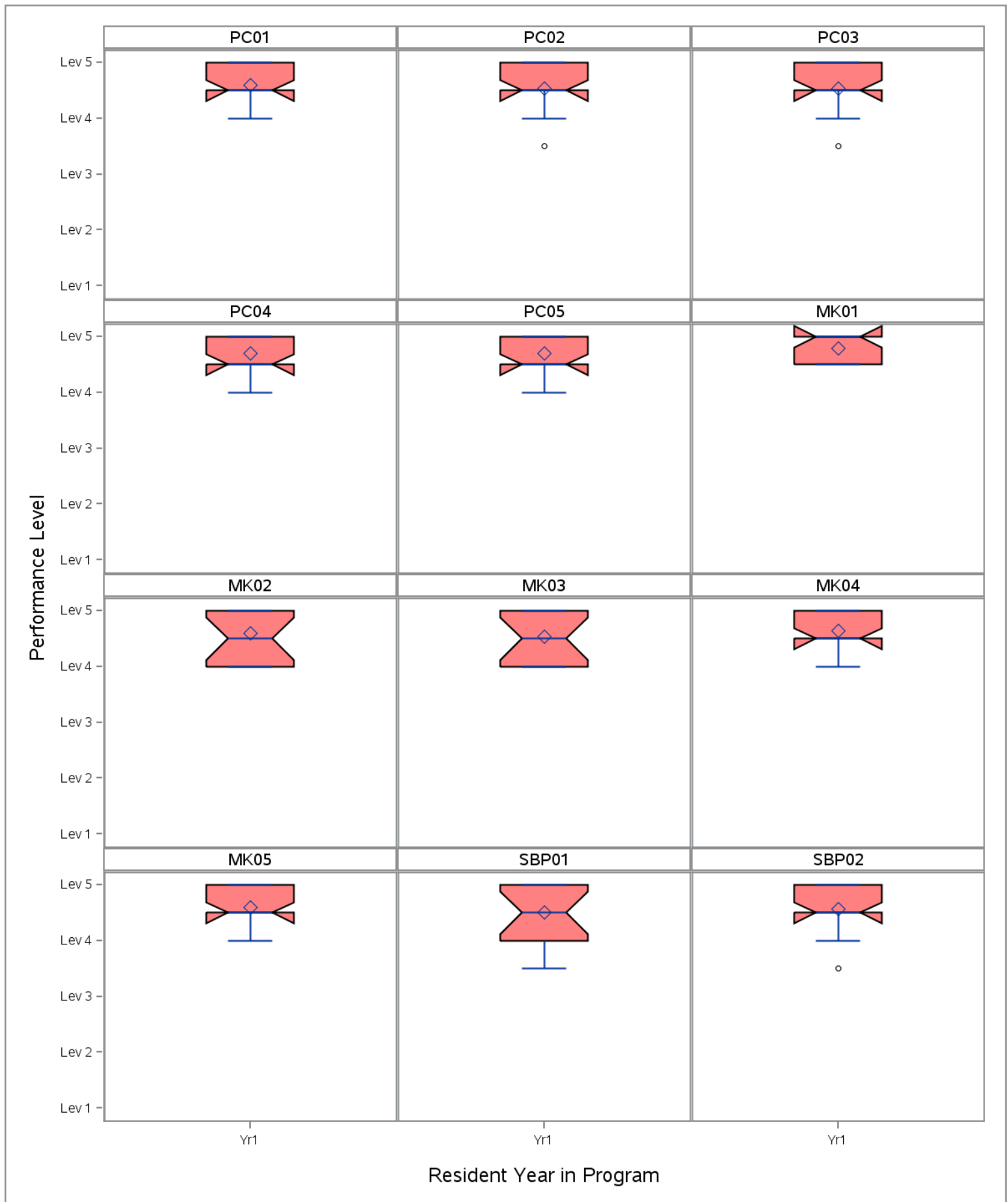


Table 66 - Musculoskeletal oncology (June 2017)



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Table 66 - Musculoskeletal oncology (June 2017)

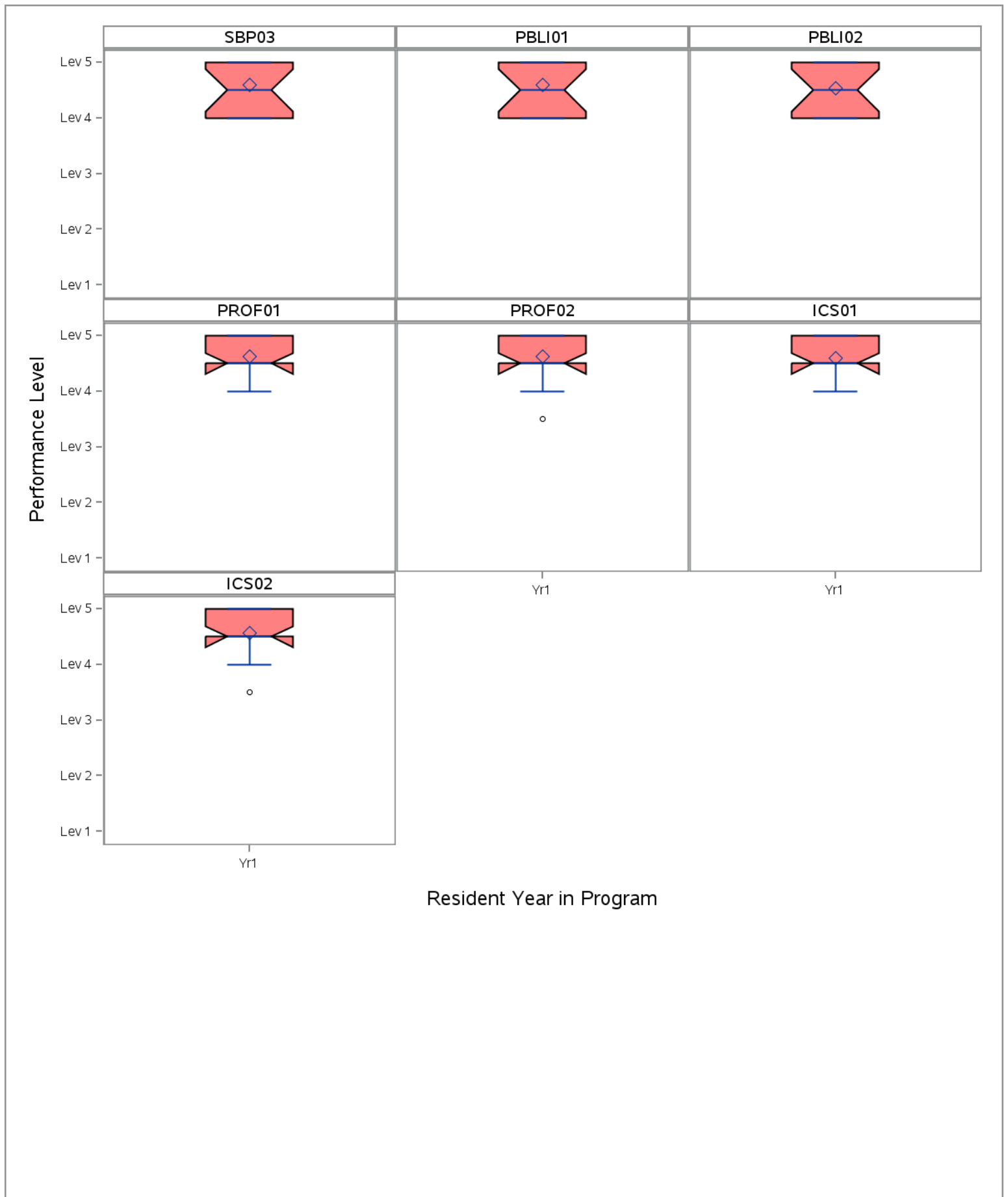
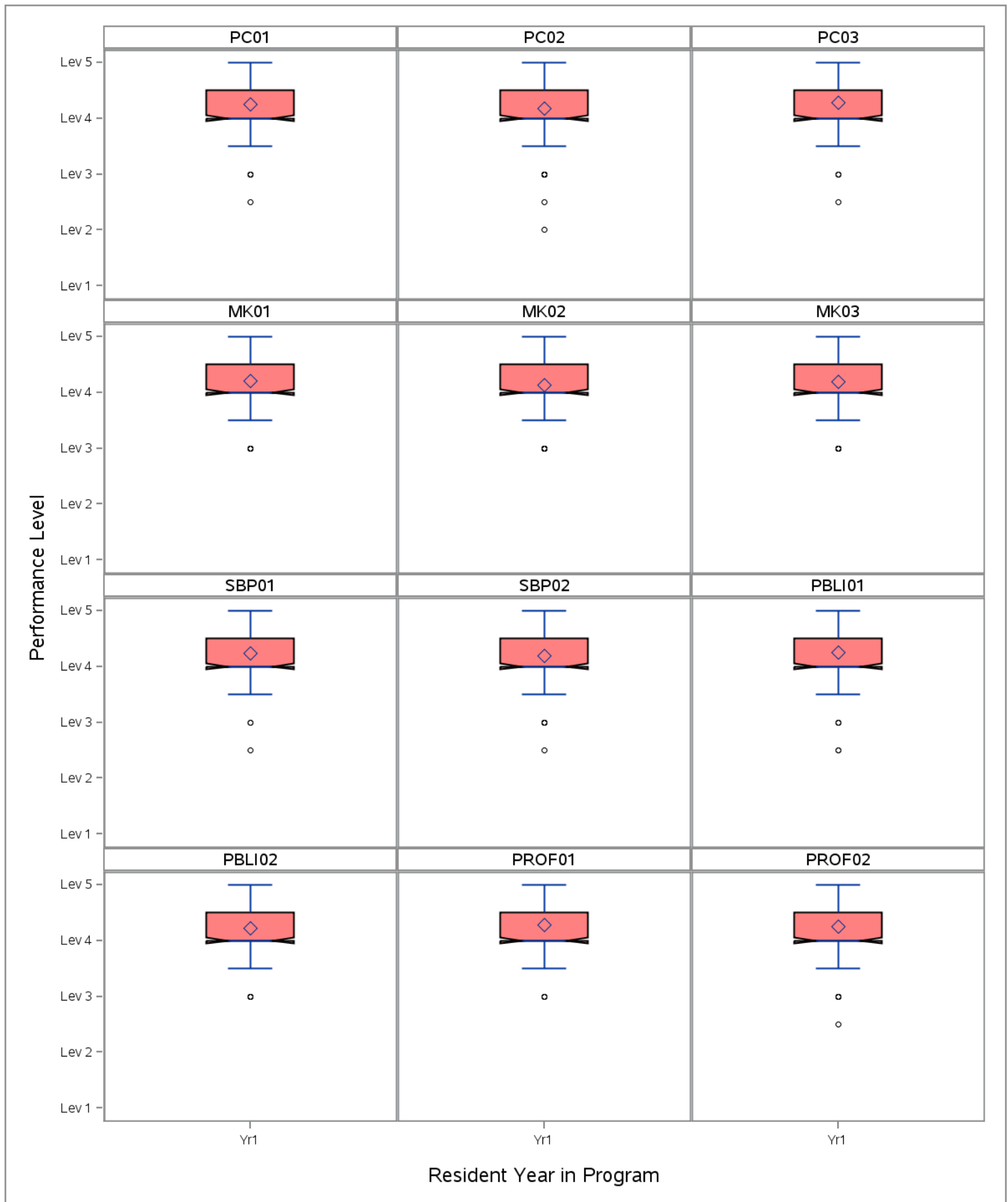


Table 67 - Orthopaedic sports medicine (June 2017)



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Table 67 - Orthopaedic sports medicine (June 2017)

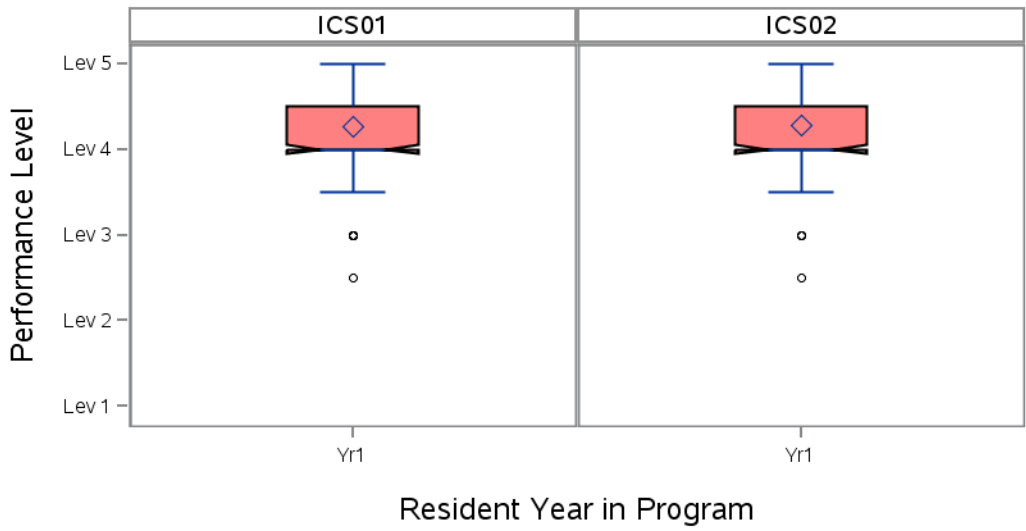
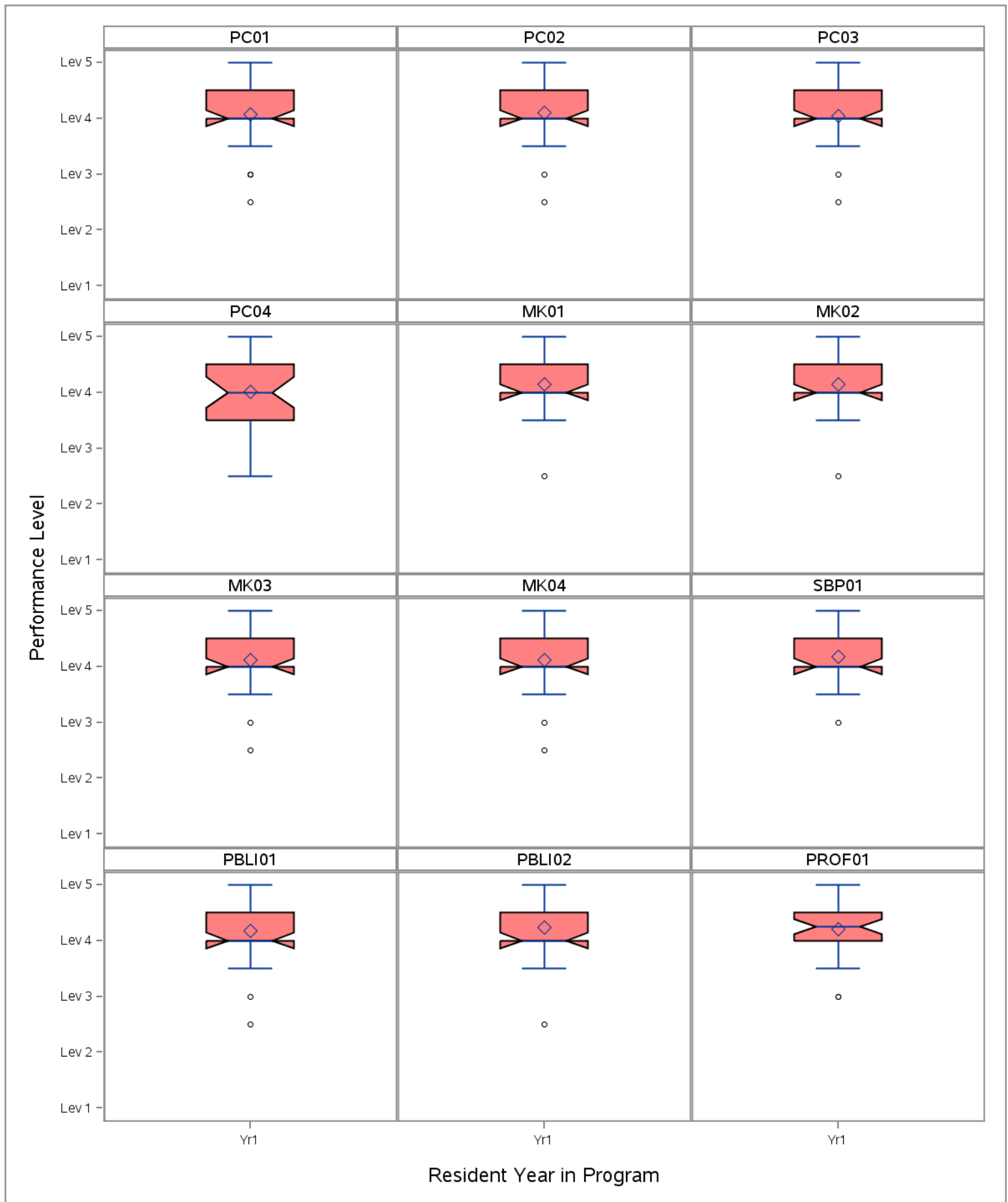


Table 68 - Orthopaedic surgery of the spine (June 2017)



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Table 68 - Orthopaedic surgery of the spine (June 2017)

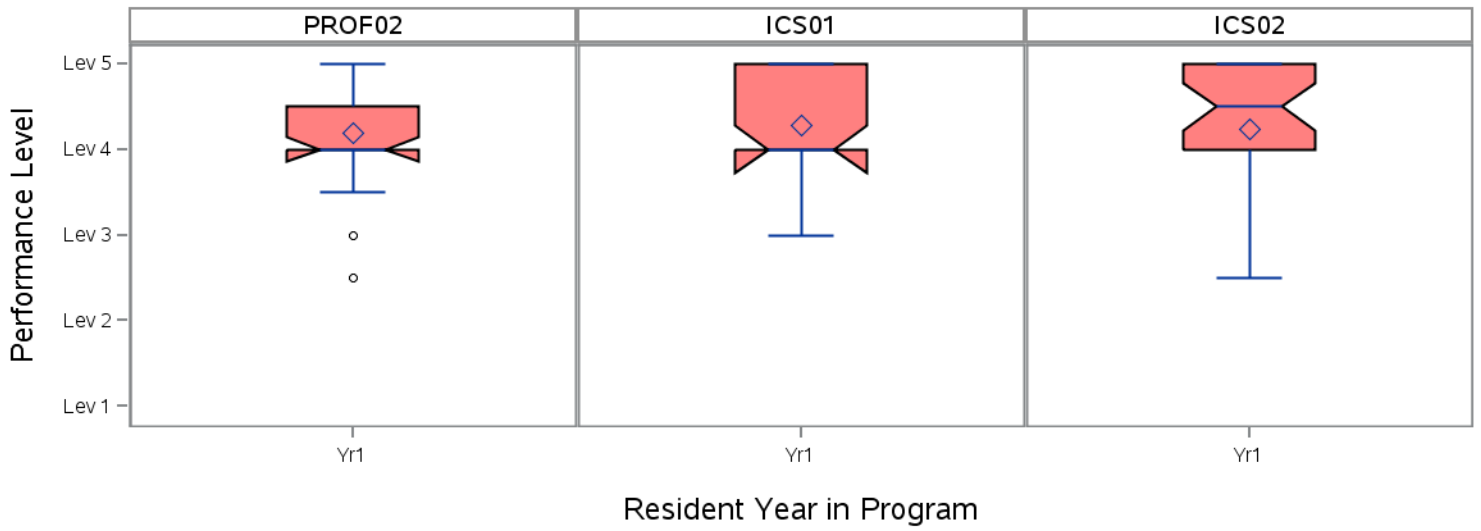
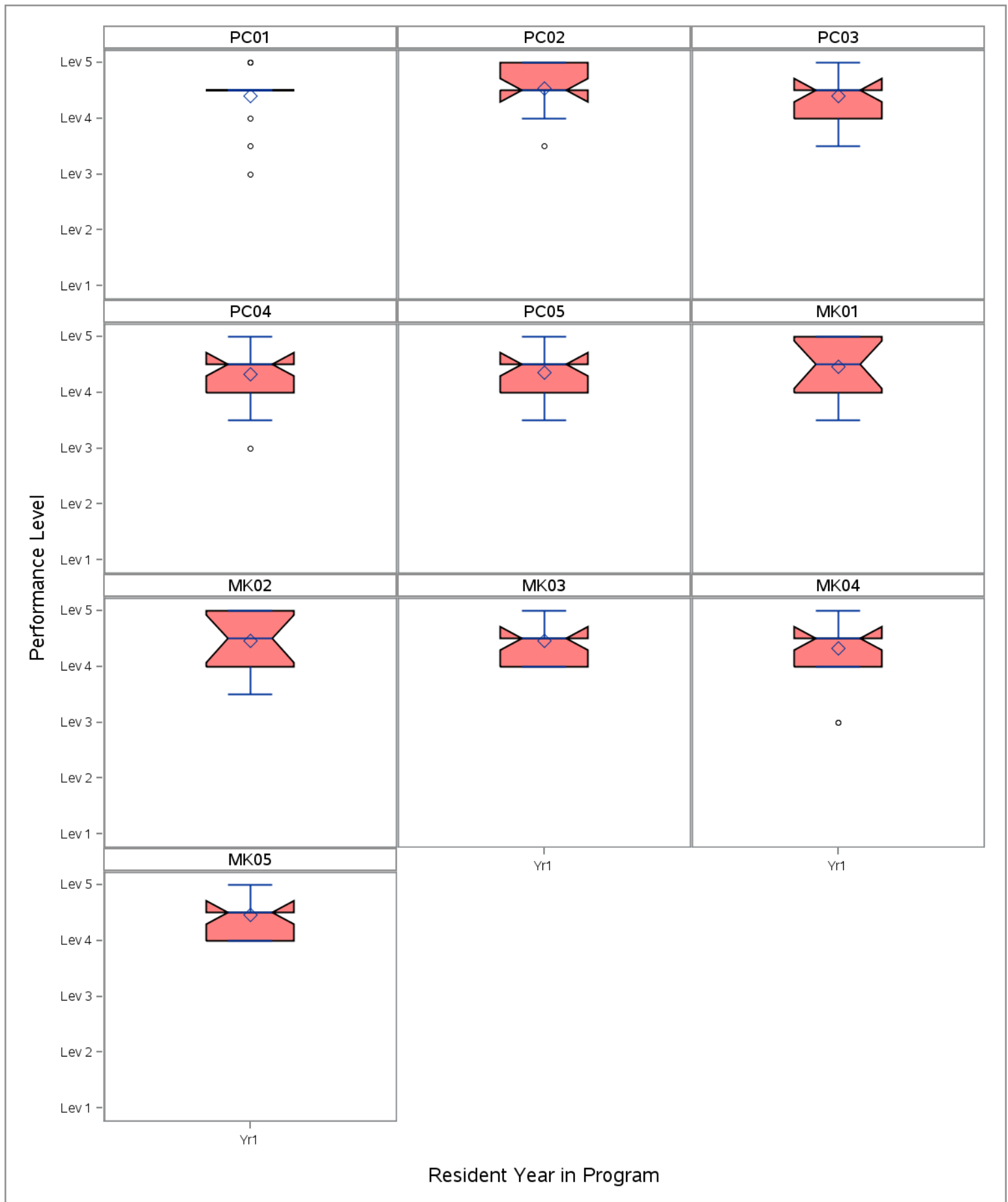


Table 69 - Orthopaedic trauma (June 2017)



Continue to next page for Orthopaedic trauma

Table 69 - Orthopaedic trauma (June 2017)

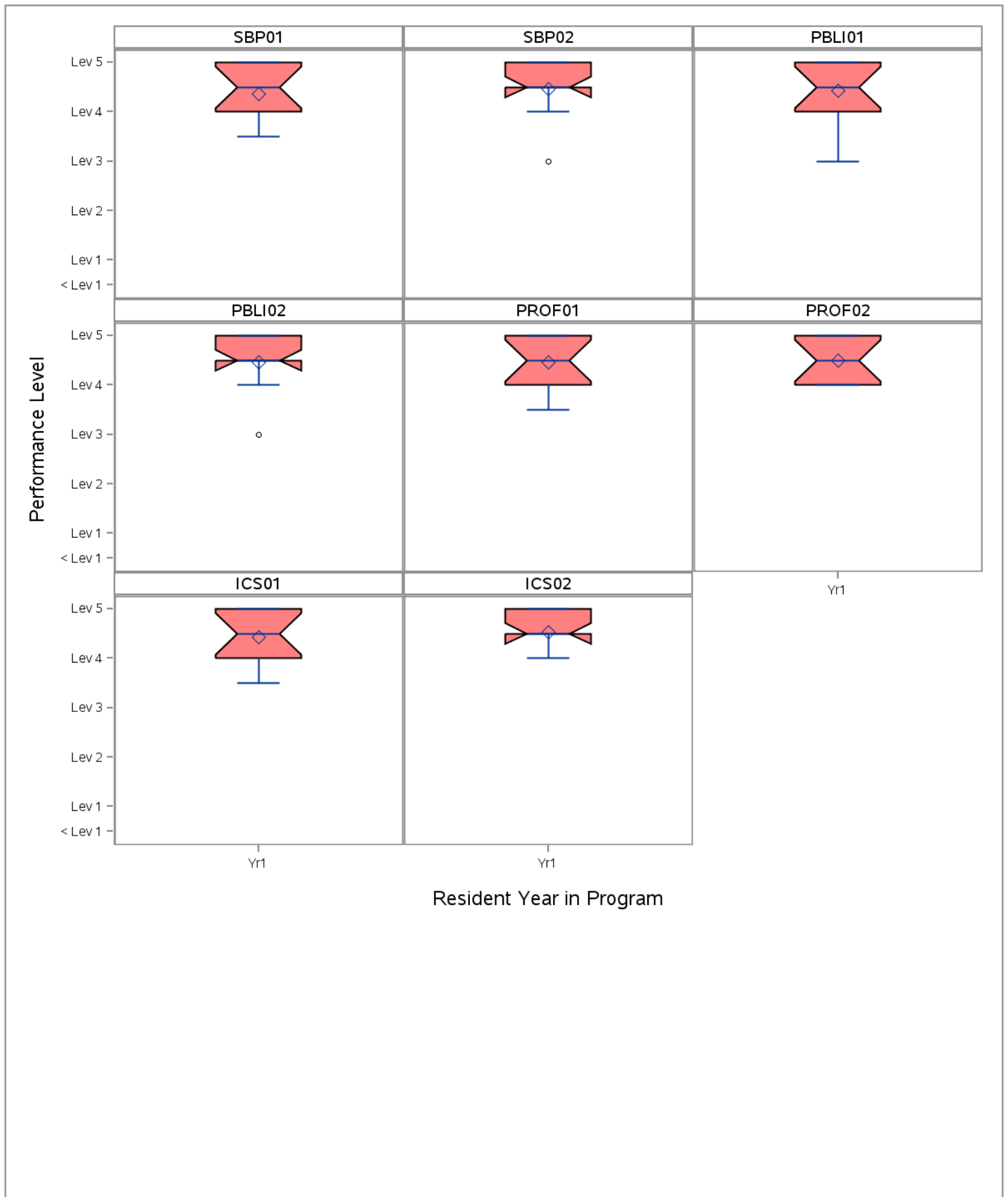
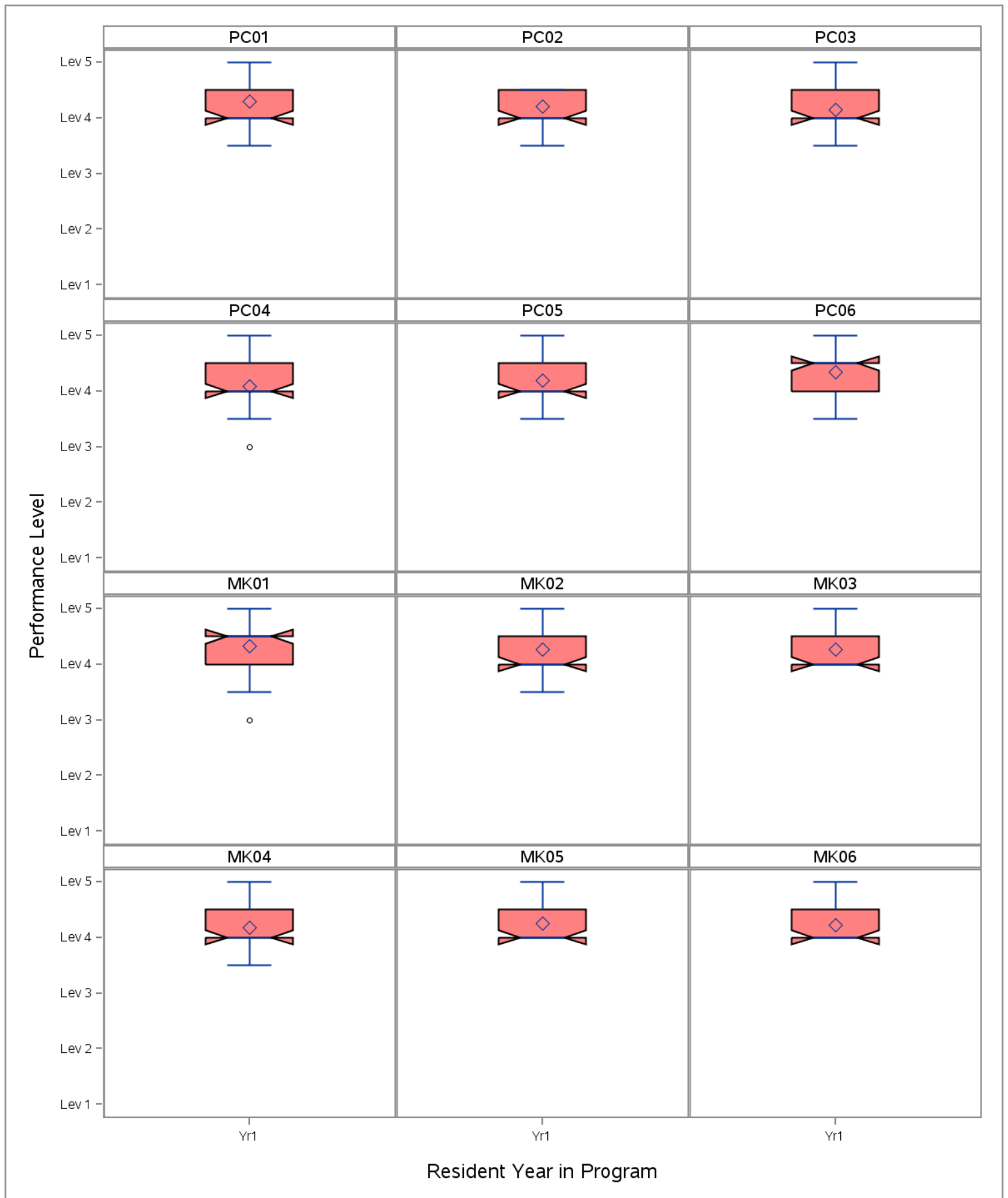


Table 70 - Pediatric orthopaedics (June 2017)



Continue to next page for Pediatric orthopaedics

Table 70 - Pediatric orthopaedics (June 2017)

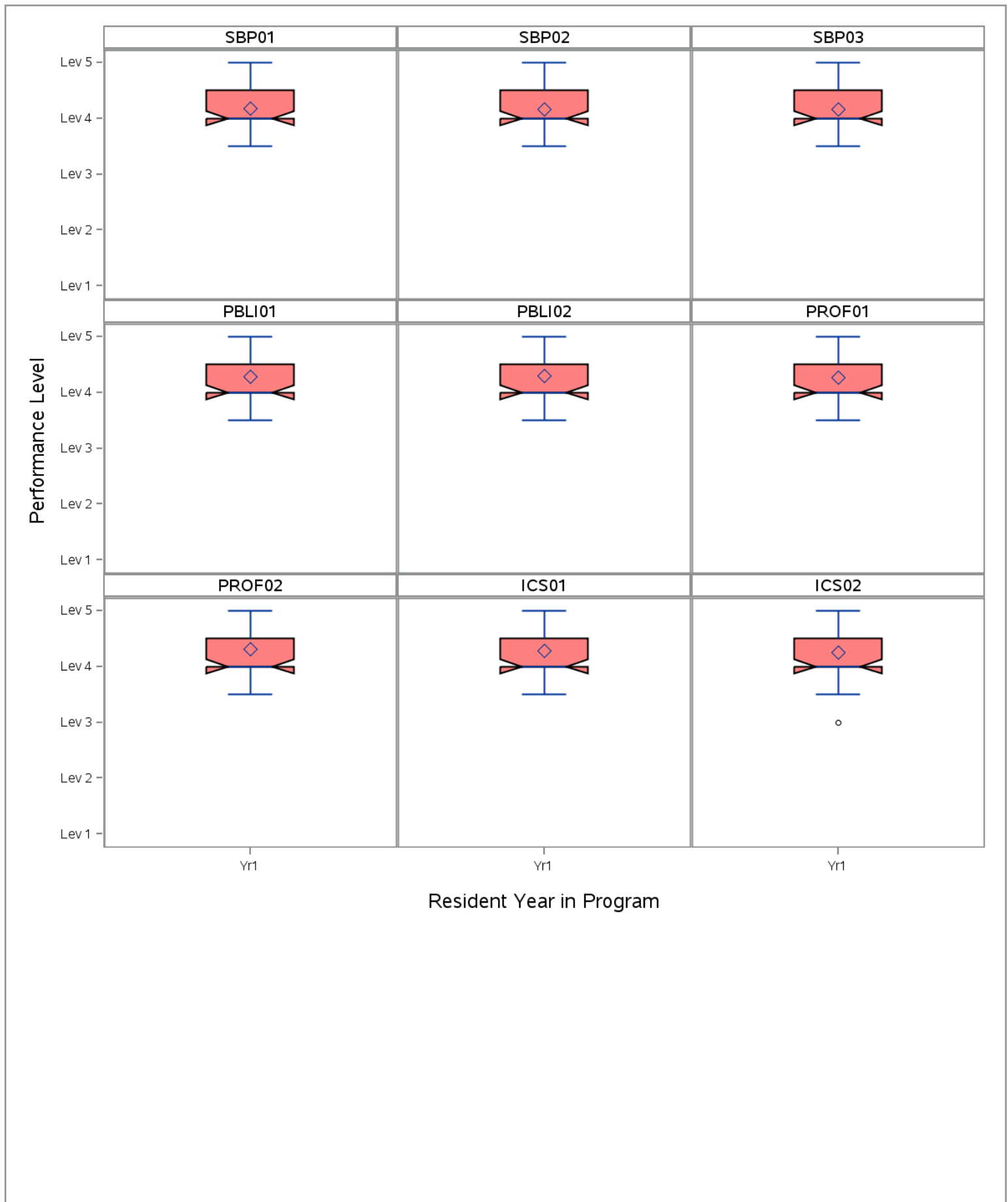
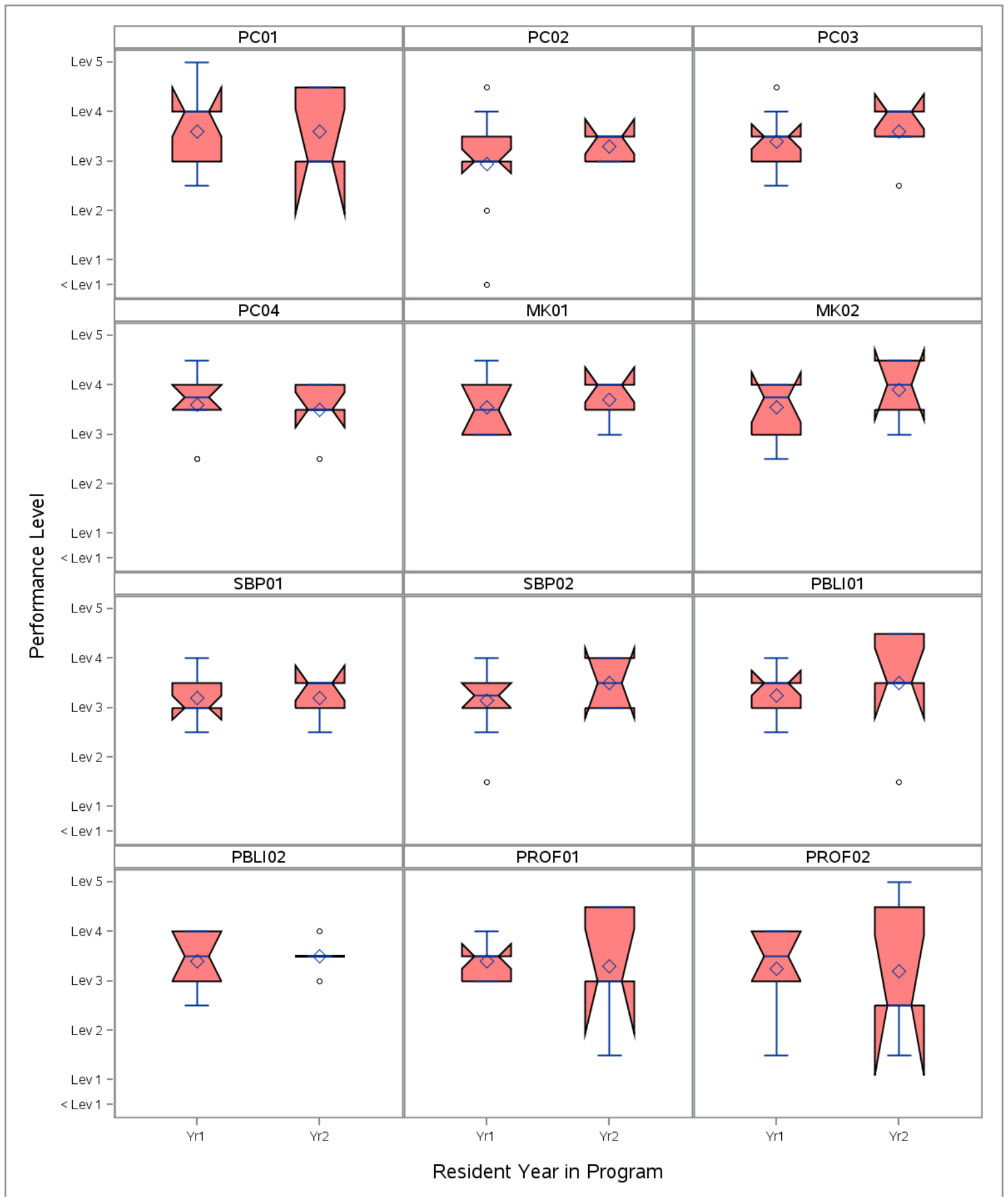


Table 71 - Osteopathic neuromusculoskeletal medicine (June 2017)



Continue to next page for Osteopathic neuromusculoskeletal medicine

Table 71 - Osteopathic neuromusculoskeletal medicine (June 2017)

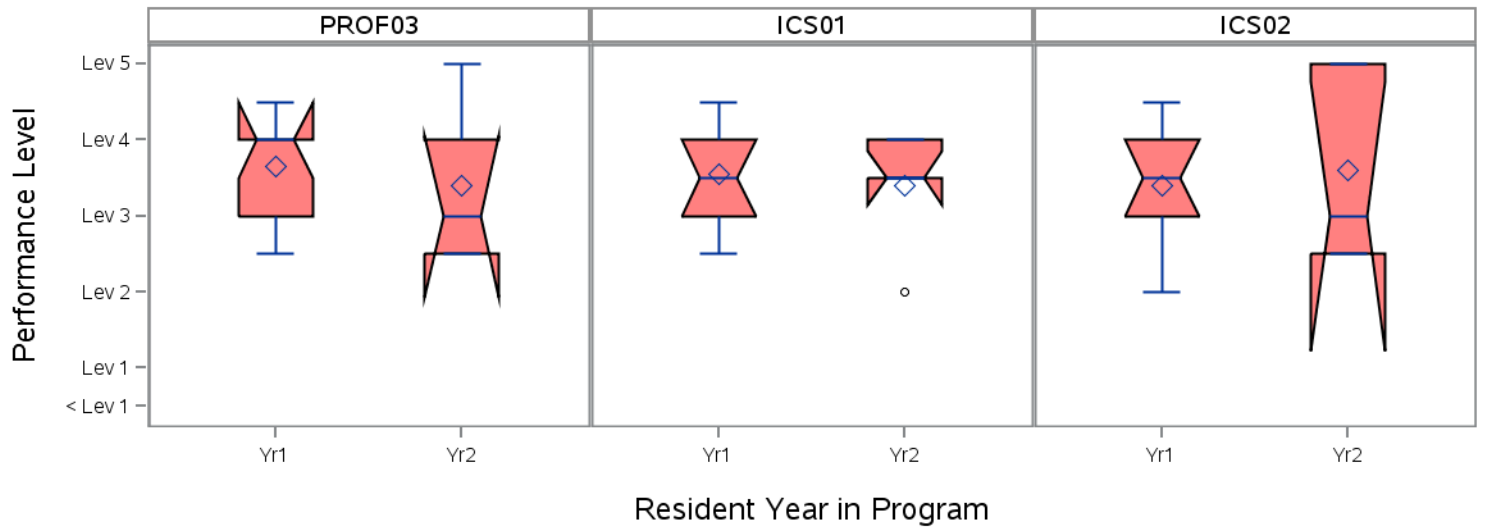
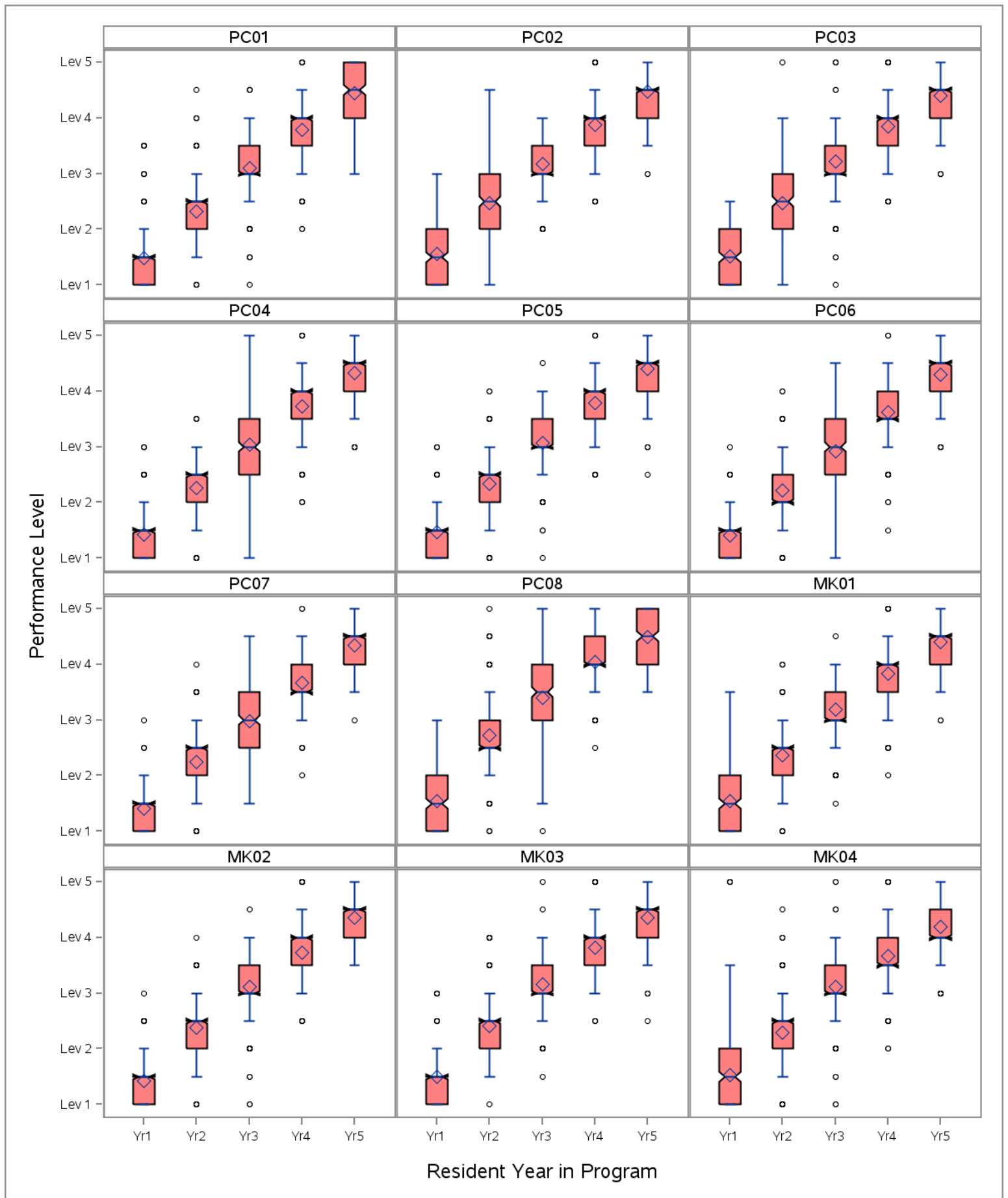


Table 72 - Otolaryngology (June 2017)



Continue to next page for Otolaryngology

Table 72 - Otolaryngology (June 2017)

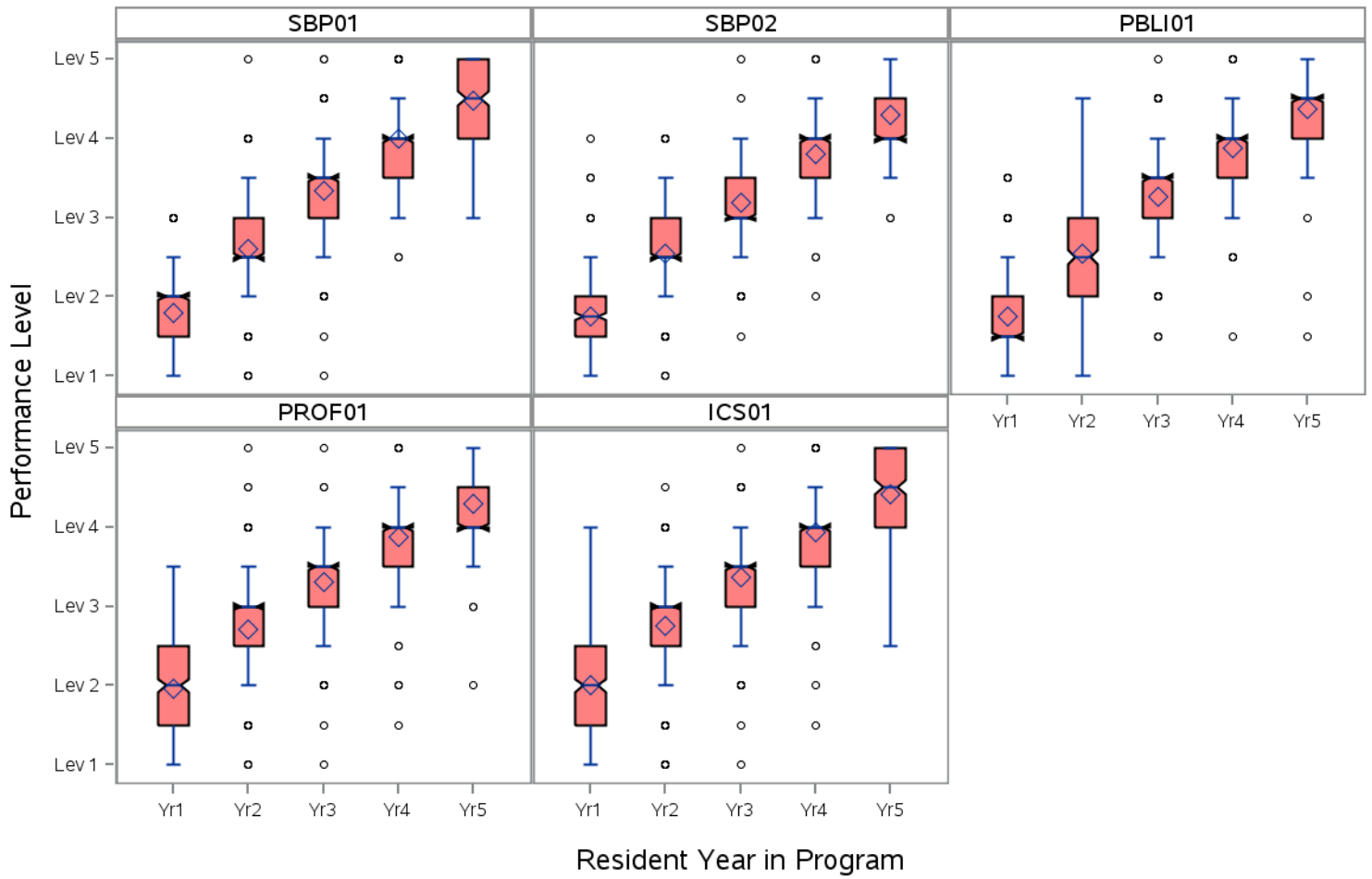
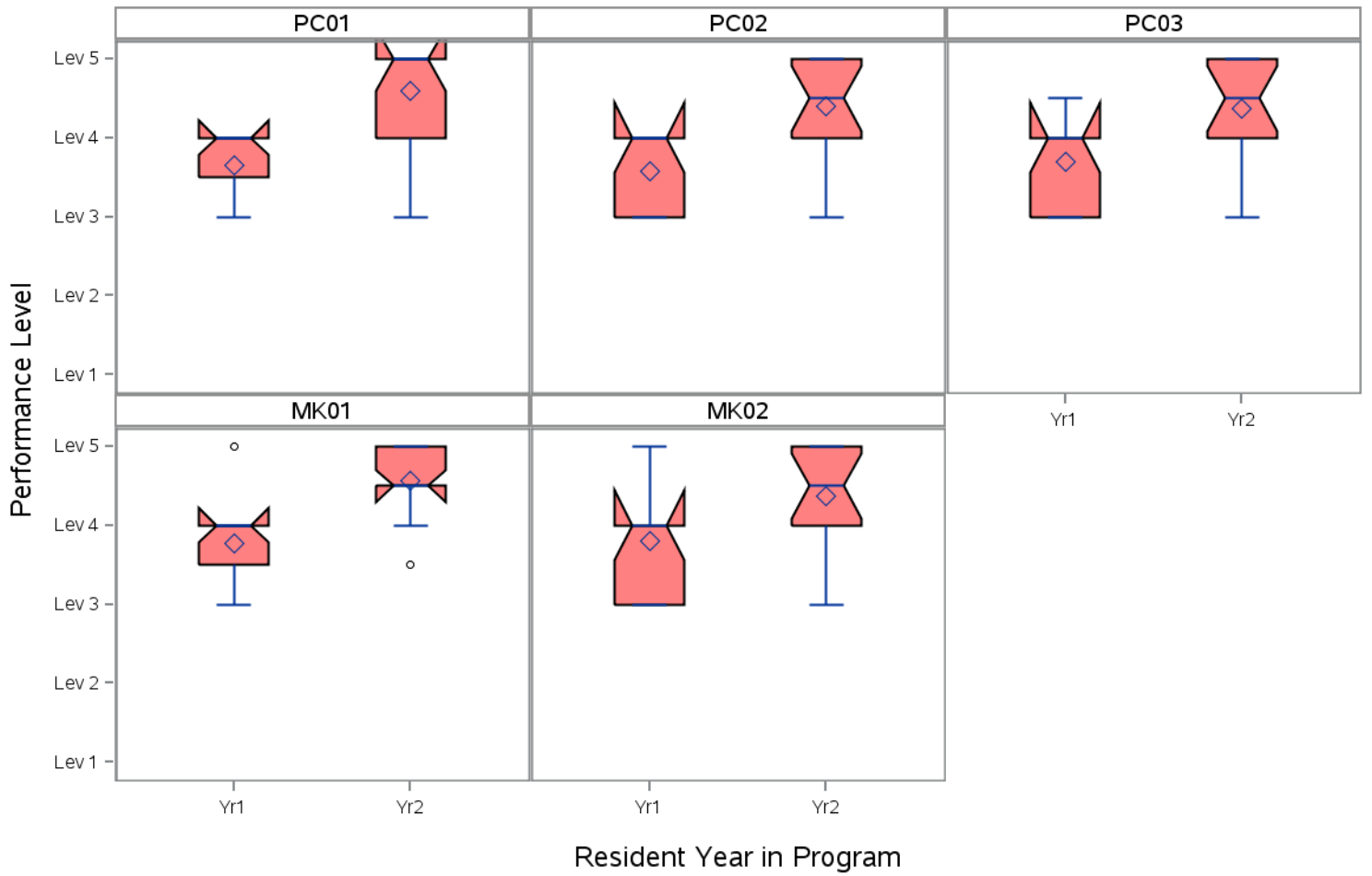


Table 73 - Neurotology (June 2017)



Continue to next page for Neurotology

Table 73 - Neurology (June 2017)

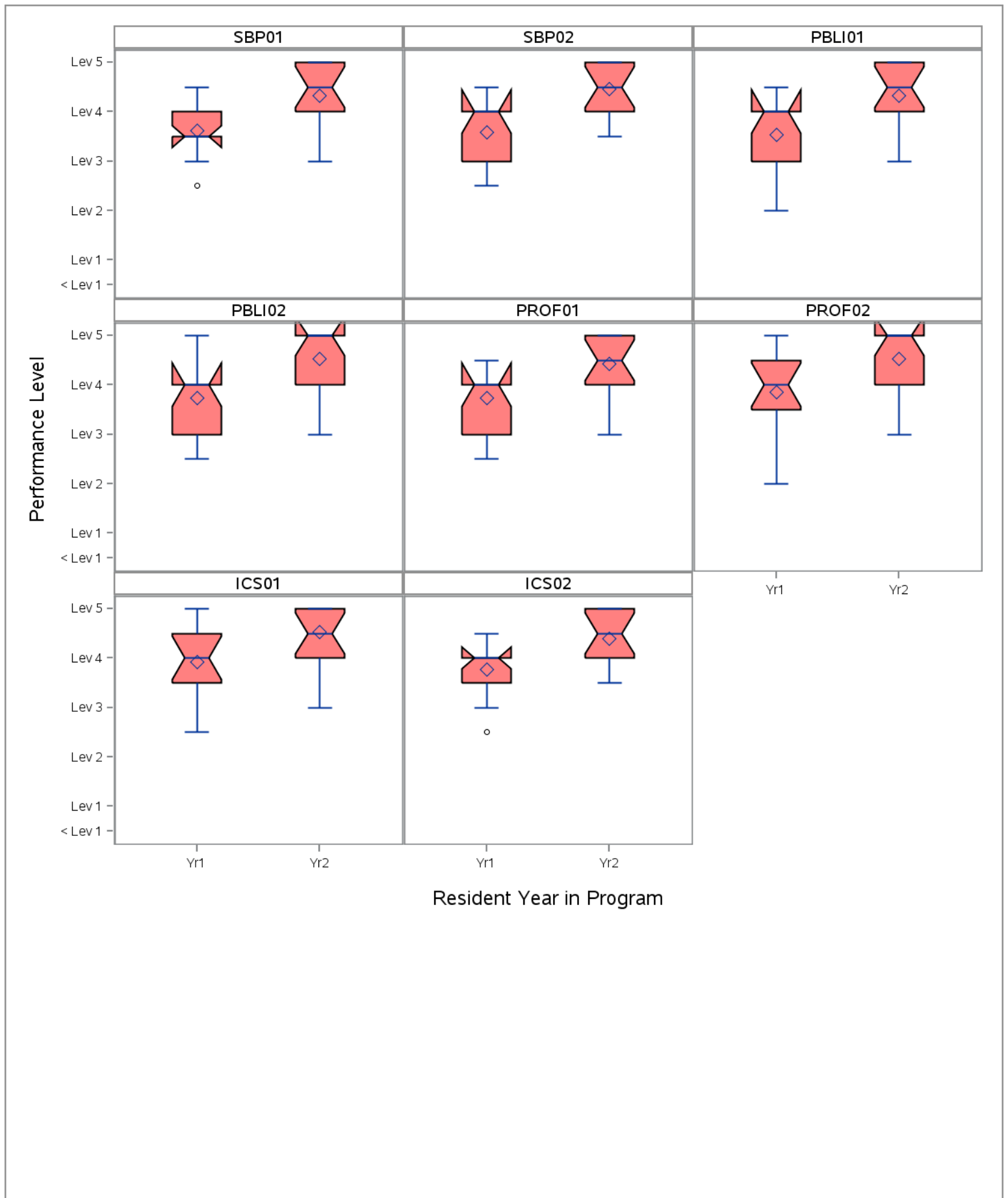
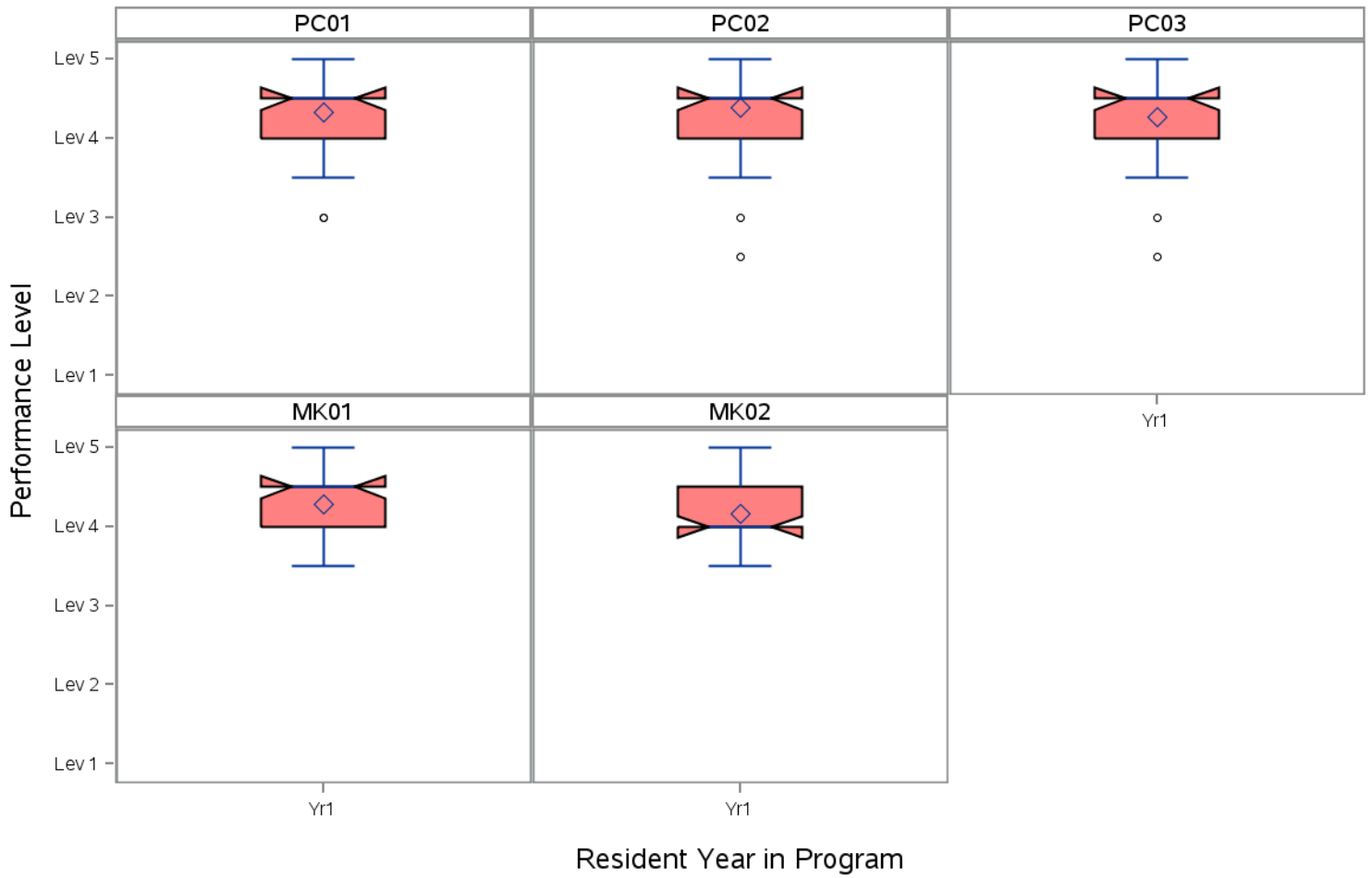


Table 74 - Pediatric otolaryngology (June 2017)



Continue to next page for Pediatric otolaryngology

Table 74 - Pediatric otolaryngology (June 2017)

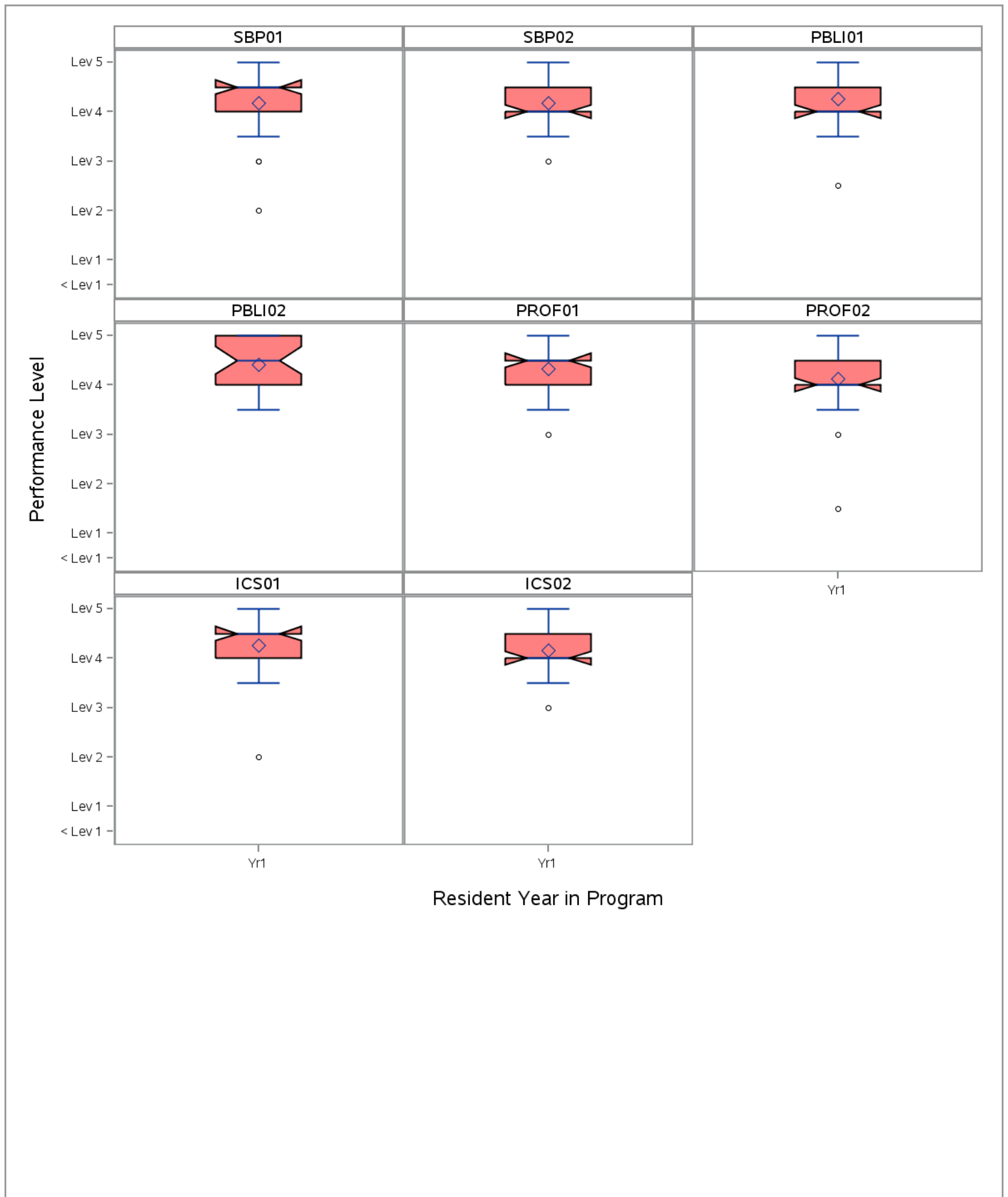
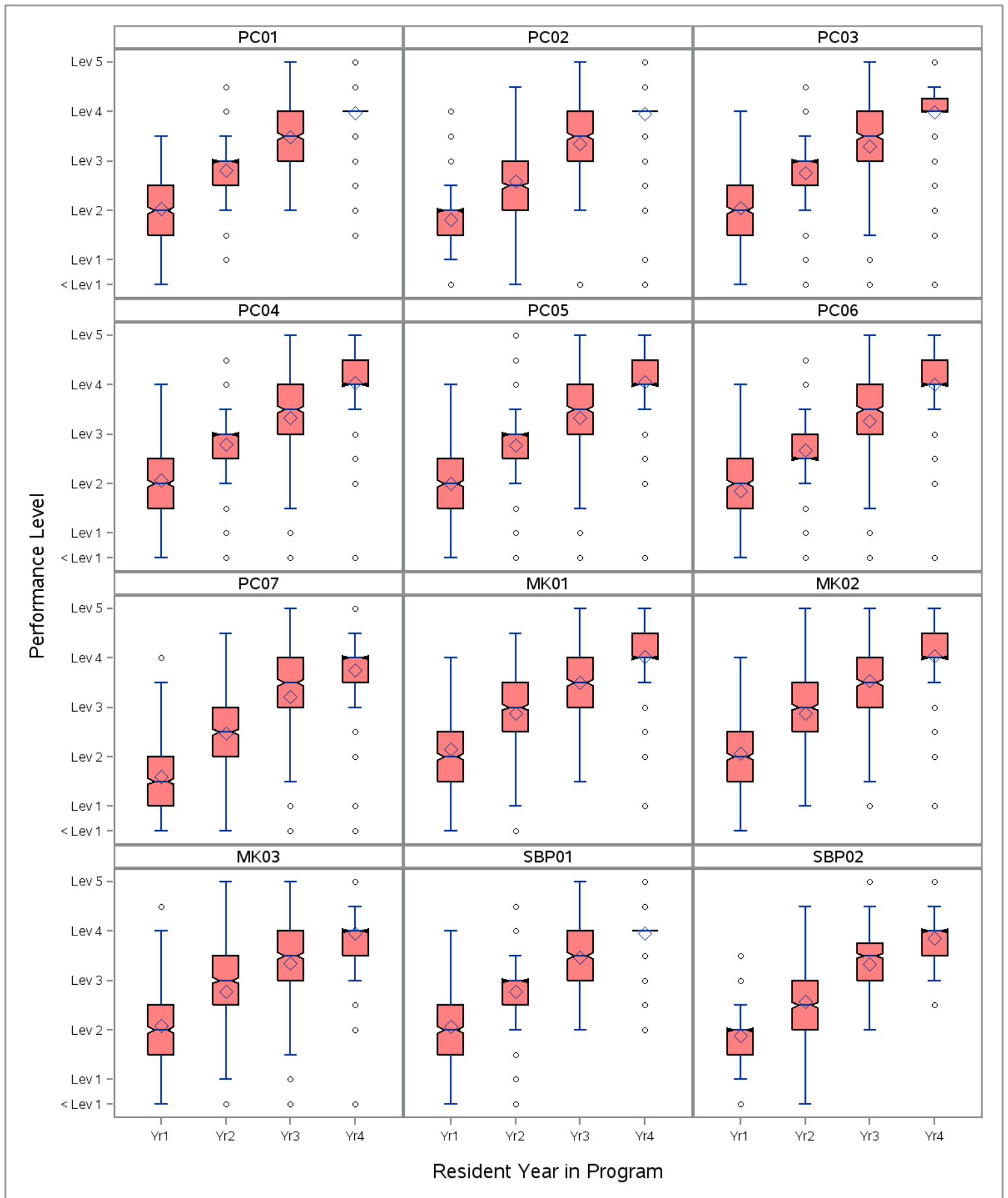
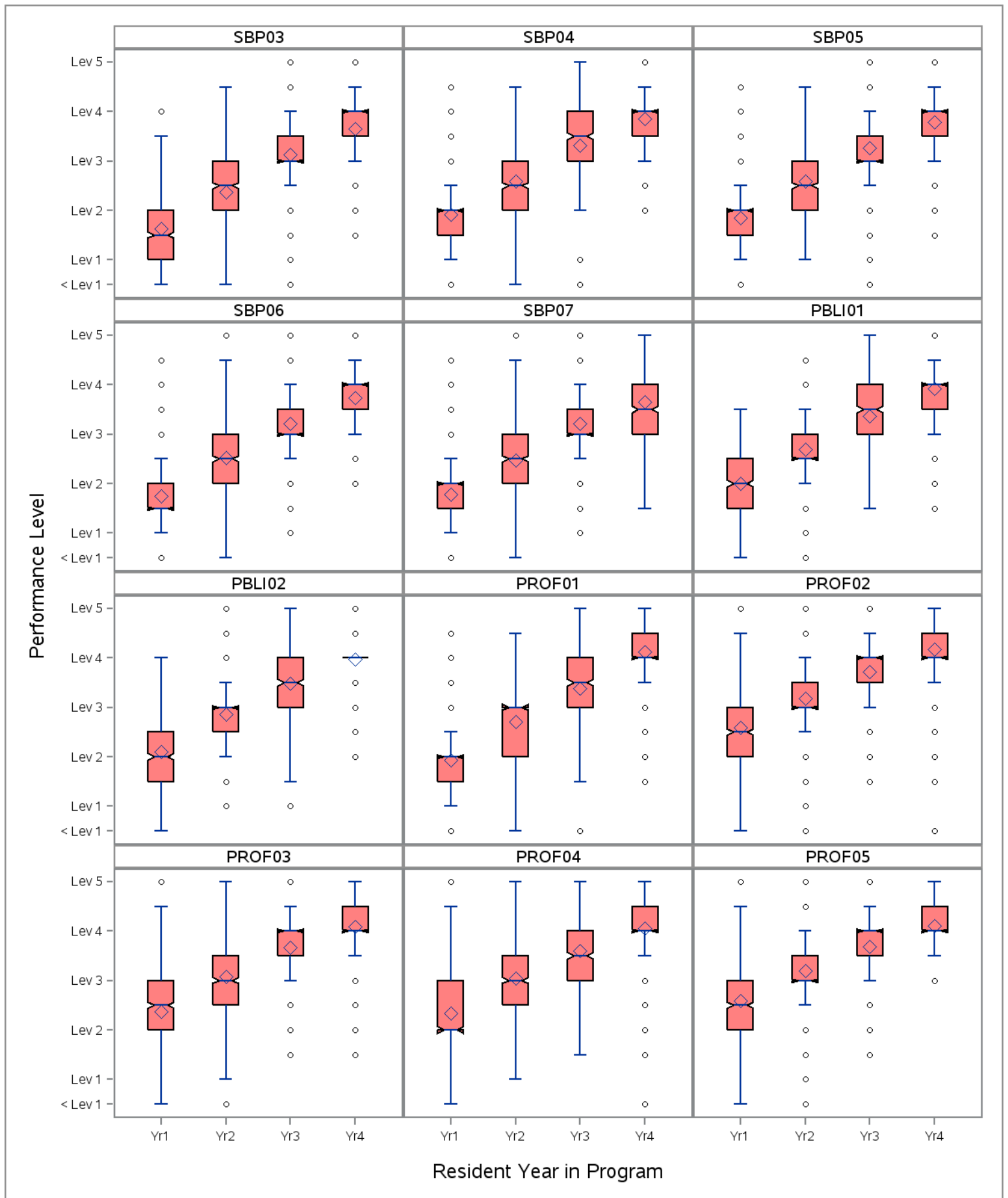


Table 75 - Pathology-anatomic and clinical (June 2017)



Continue to next page for Pathology-anatomic and clinical

Table 75 - Pathology-anatomic and clinical (June 2017)



Continue to next page for Pathology-anatomic and clinical

Table 75 - Pathology-anatomic and clinical (June 2017)

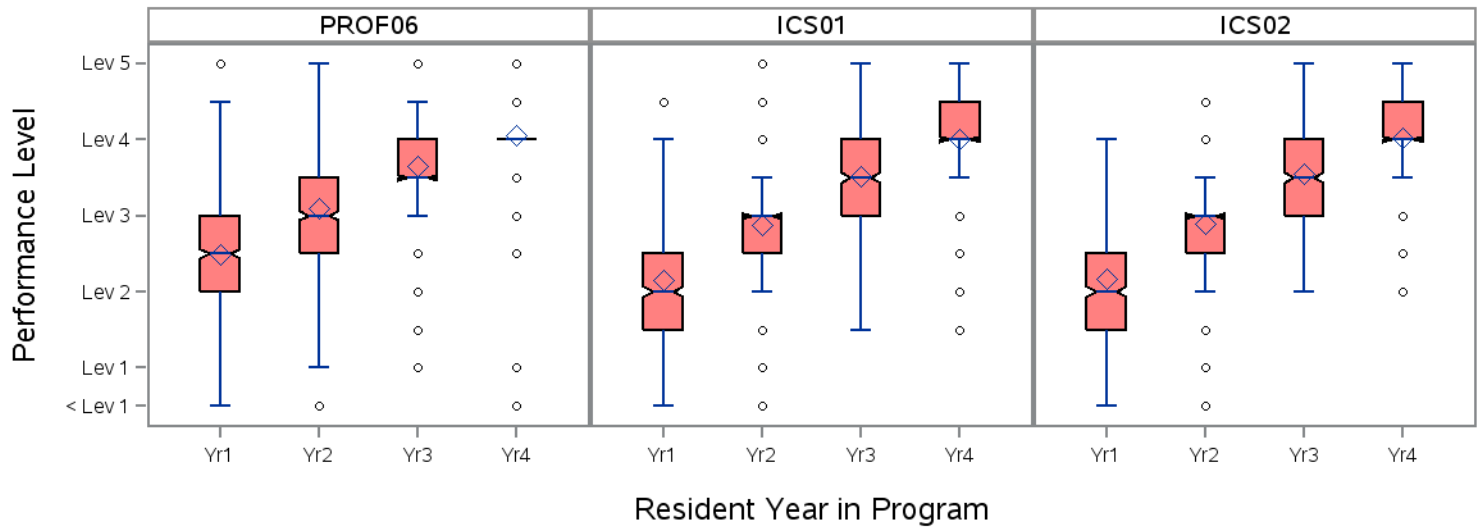
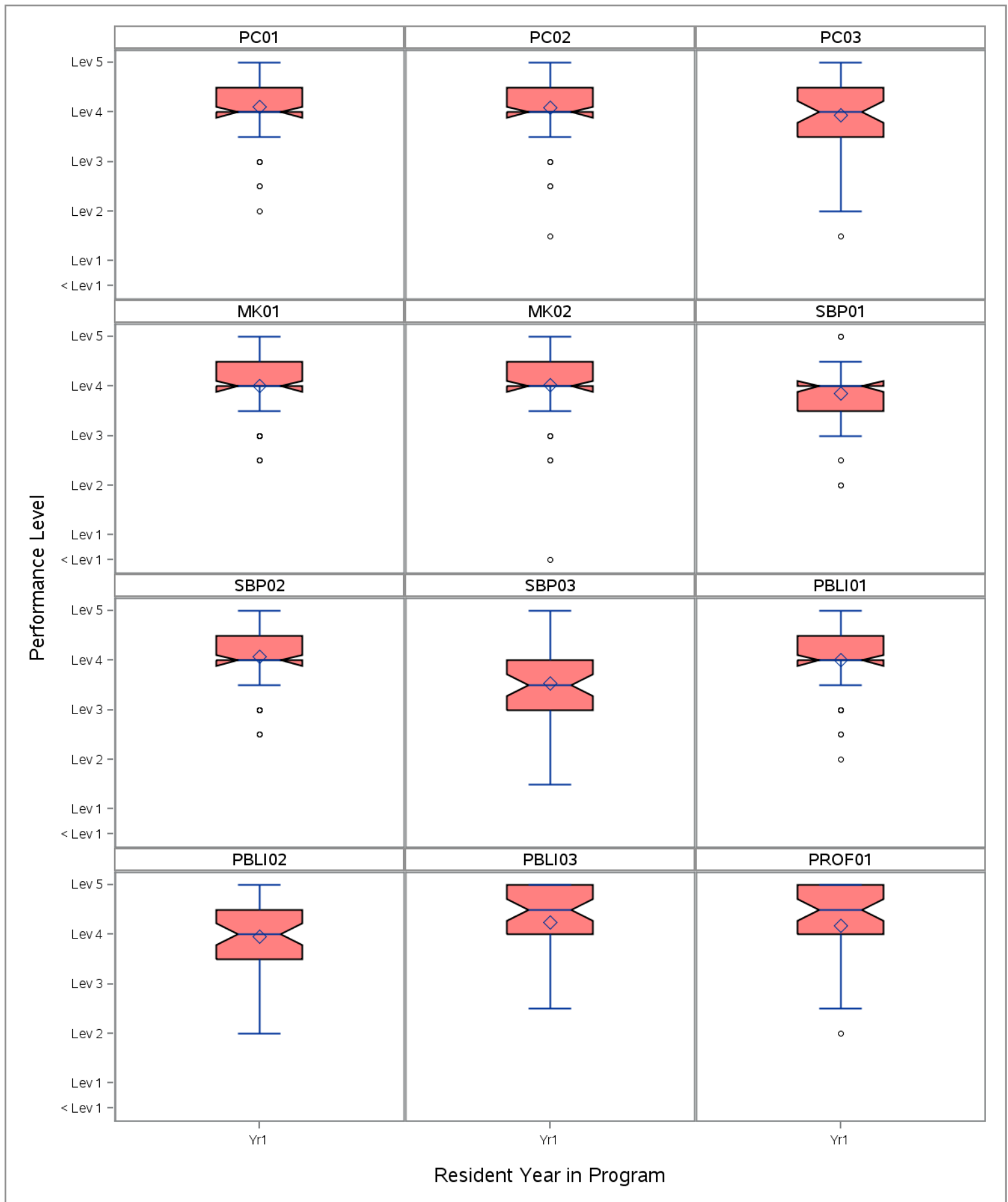


Table 76 - Blood banking/transfusion medicine (June 2017)



Continue to next page for Blood banking/transfusion medicine

Table 76 - Blood banking/transfusion medicine (June 2017)

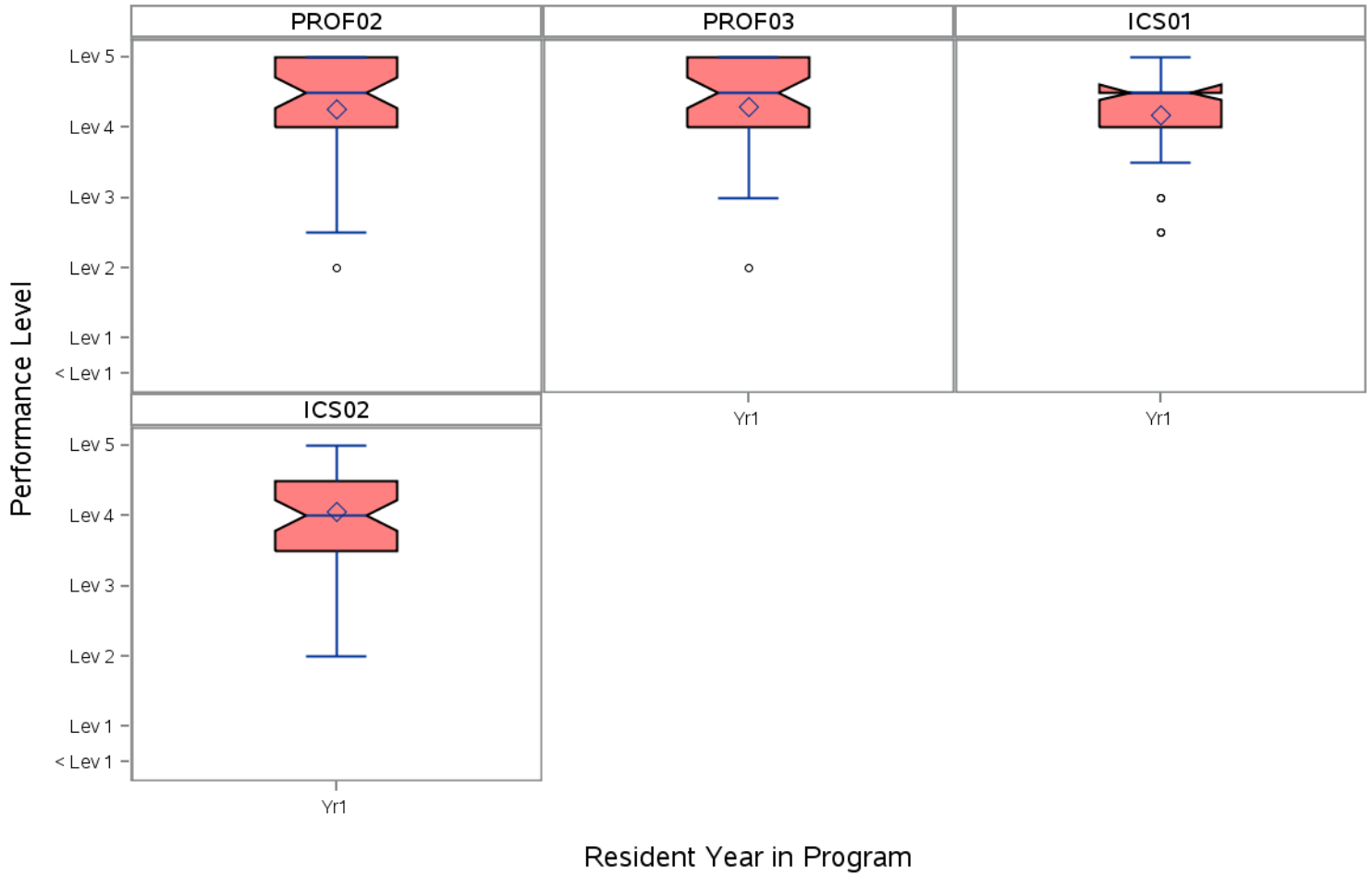
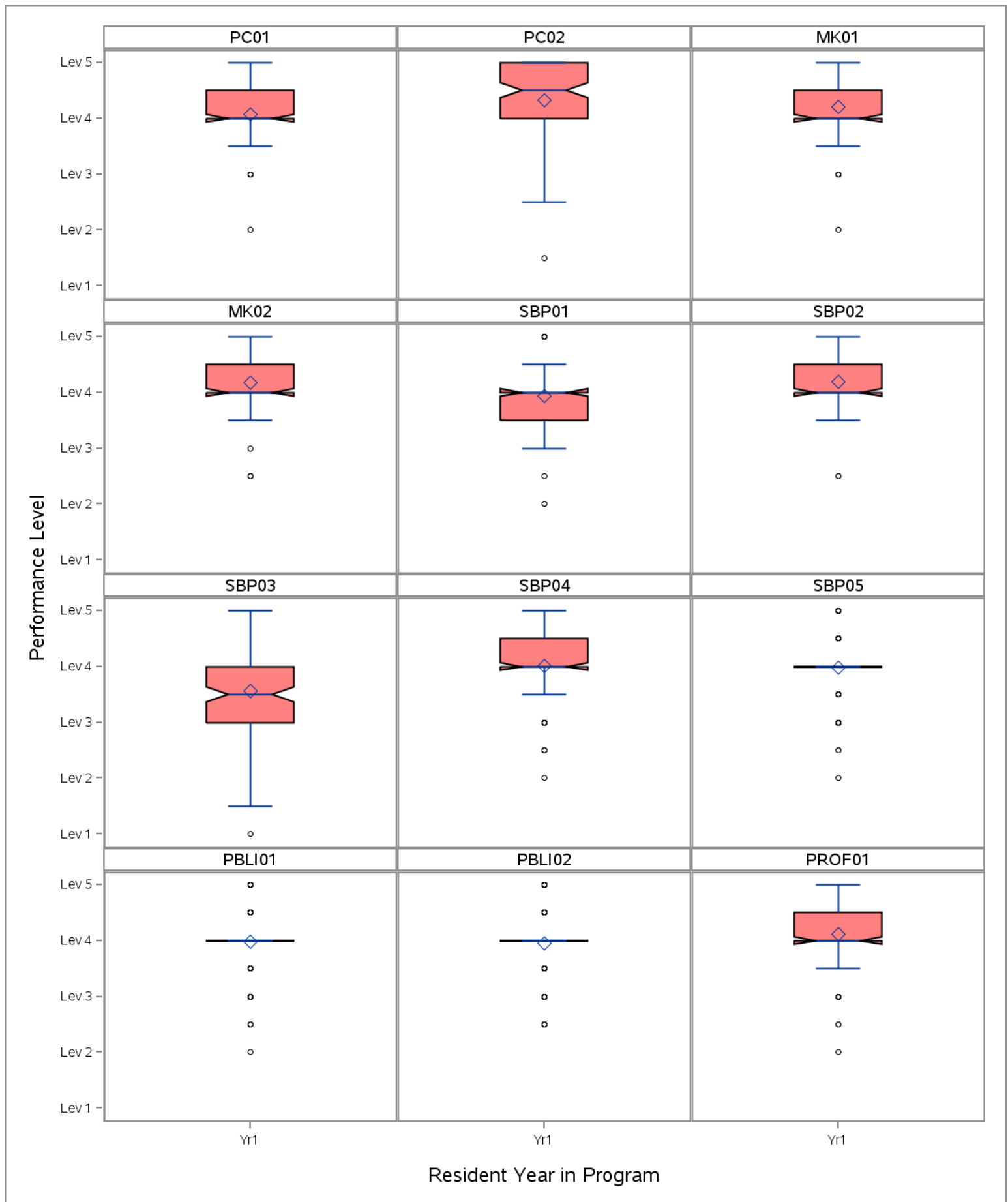


Table 77 - Cytopathology (June 2017)



Continue to next page for Cytopathology

Table 77 - Cytopathology (June 2017)

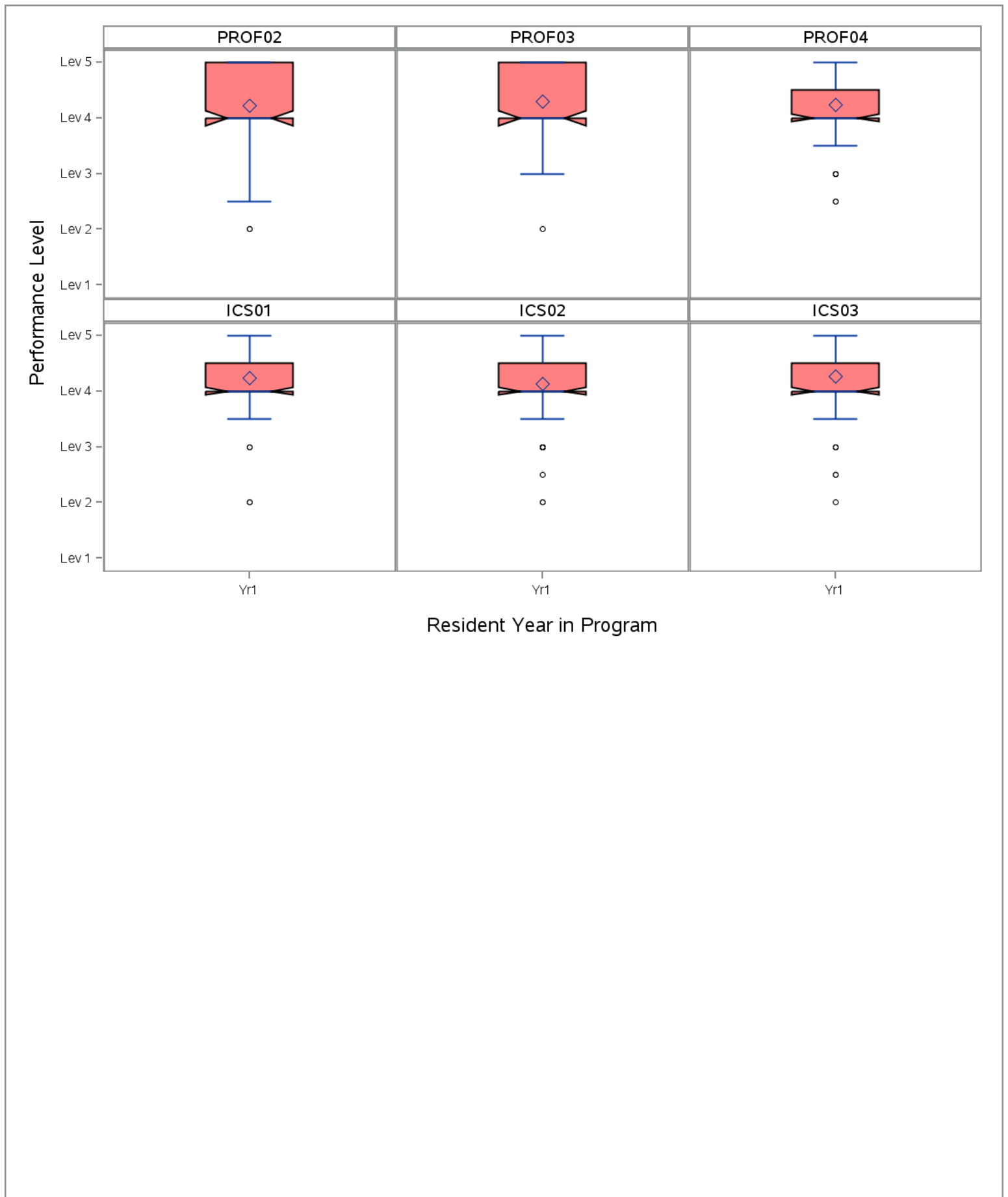
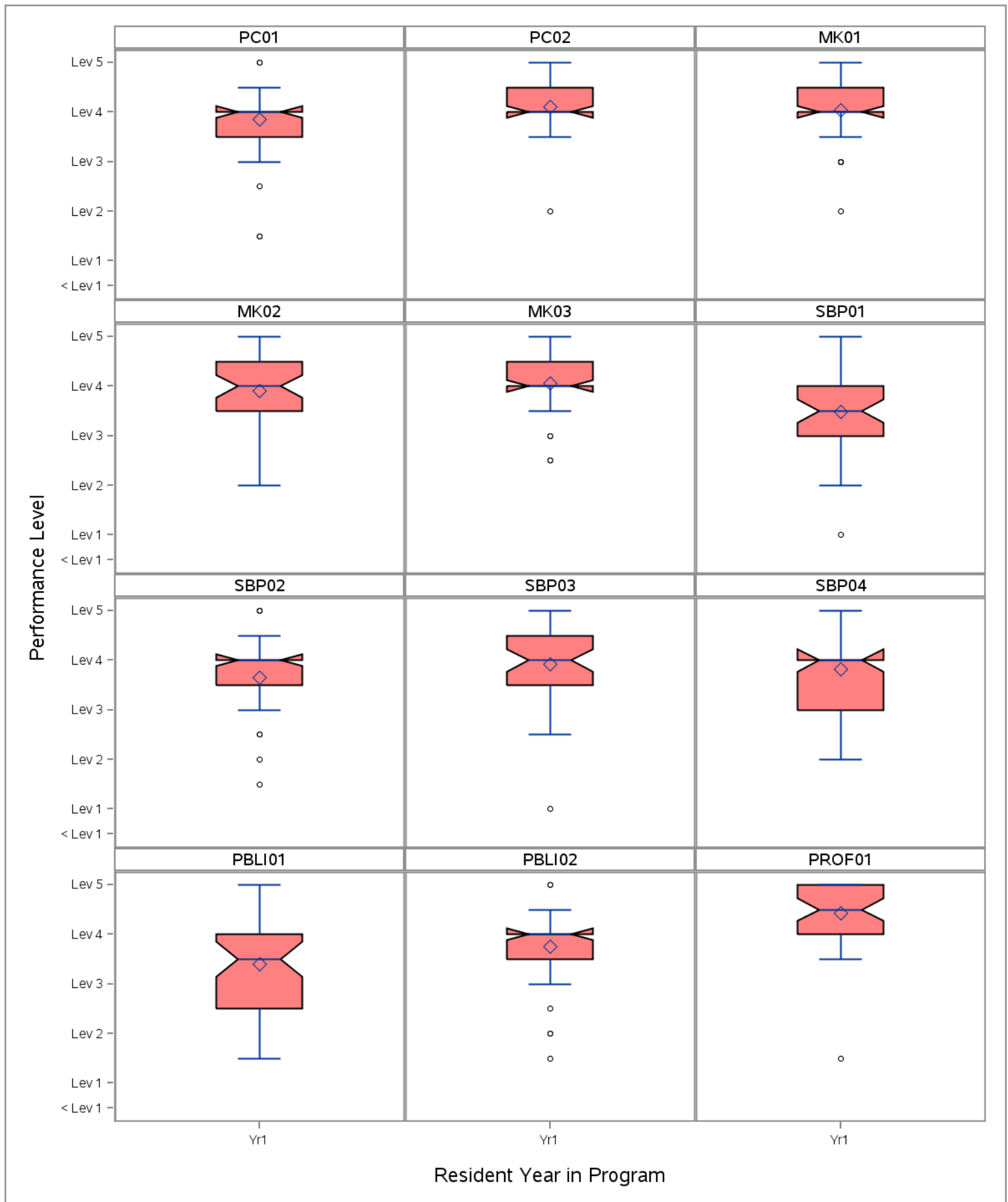


Table 78 - Forensic pathology (June 2017)



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Table 78 - Forensic pathology (June 2017)

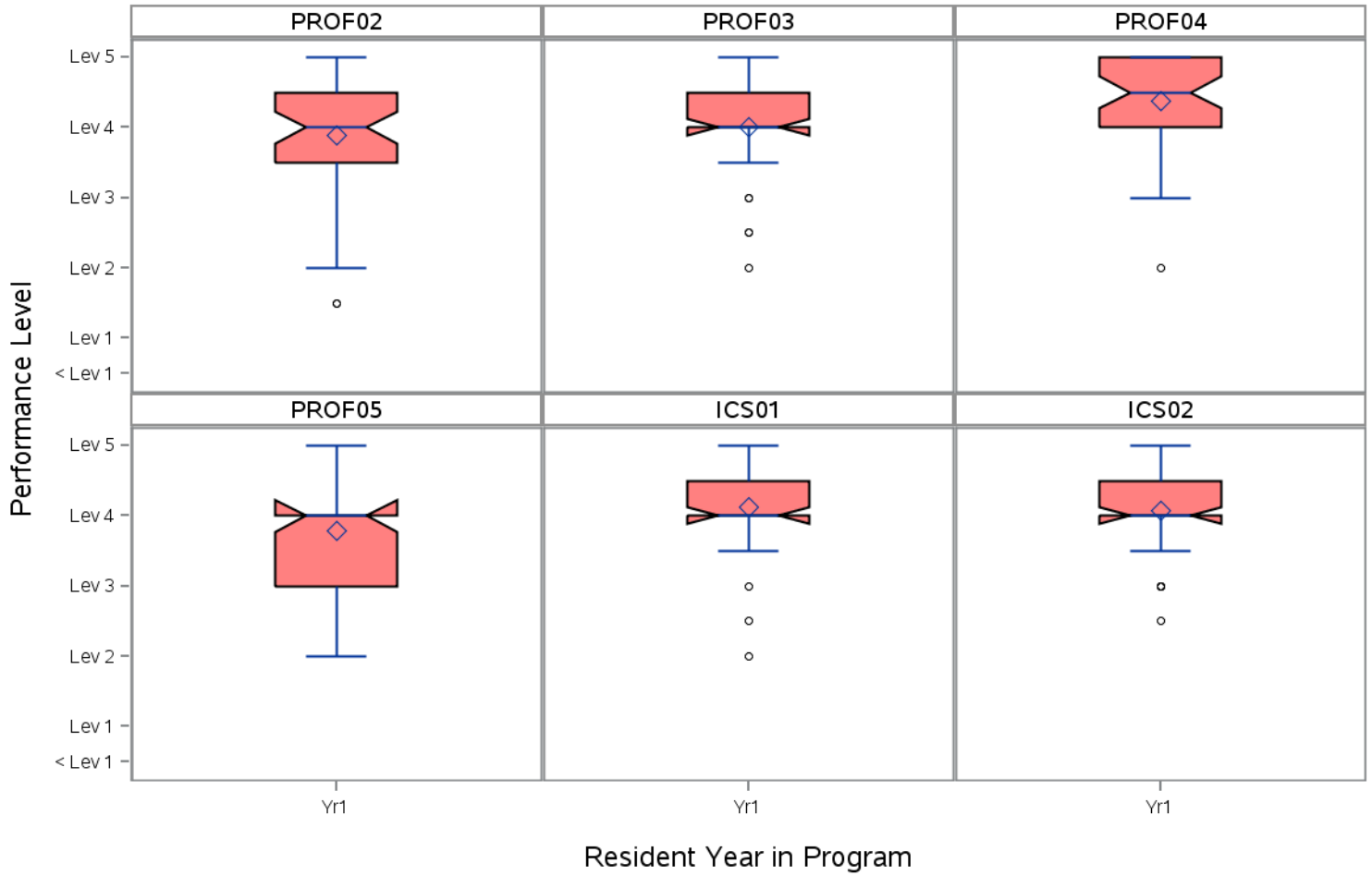
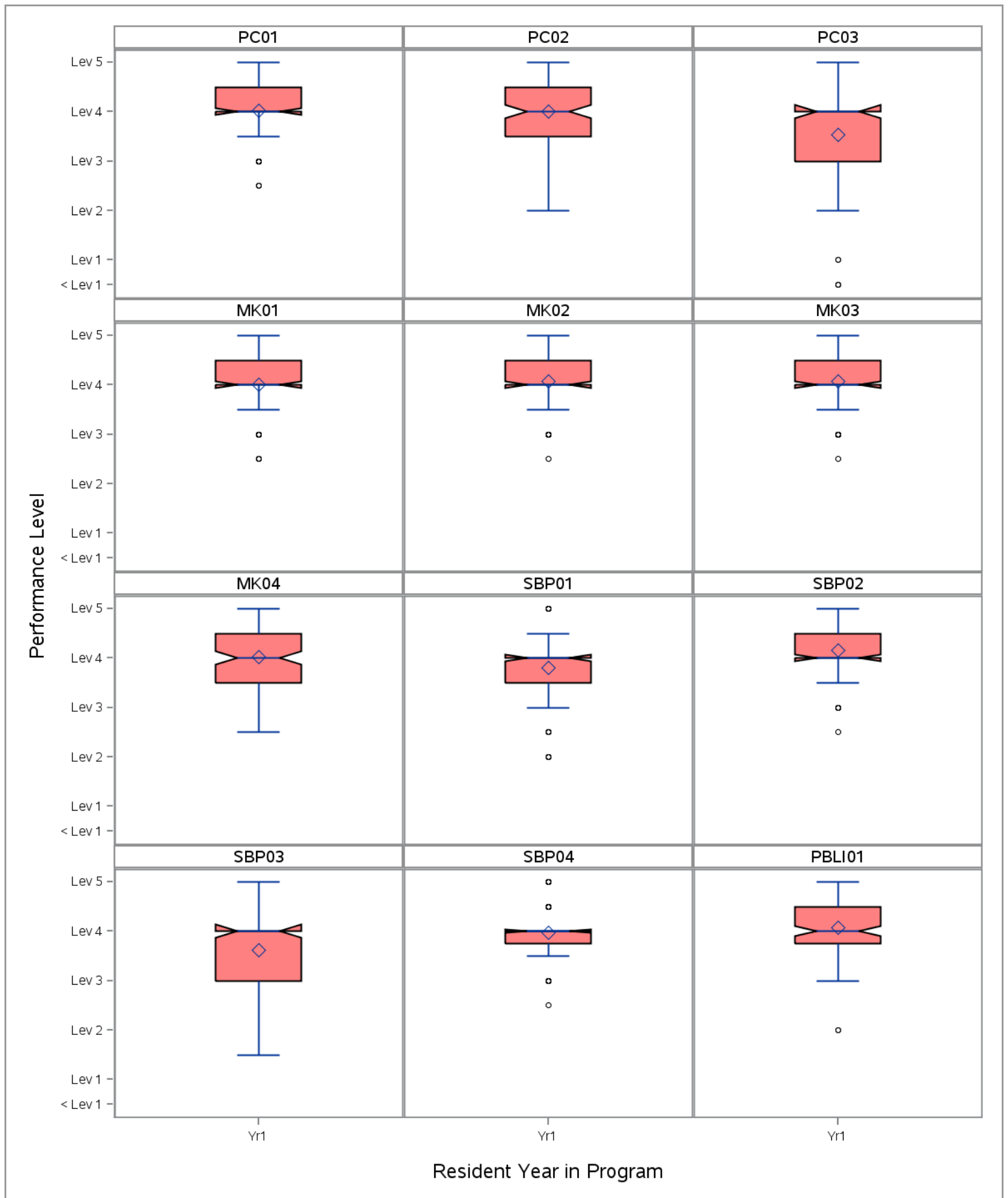


Table 79 - Hematopathology (June 2017)



Continue to next page for Hematopathology

Table 79 - Hematopathology (June 2017)

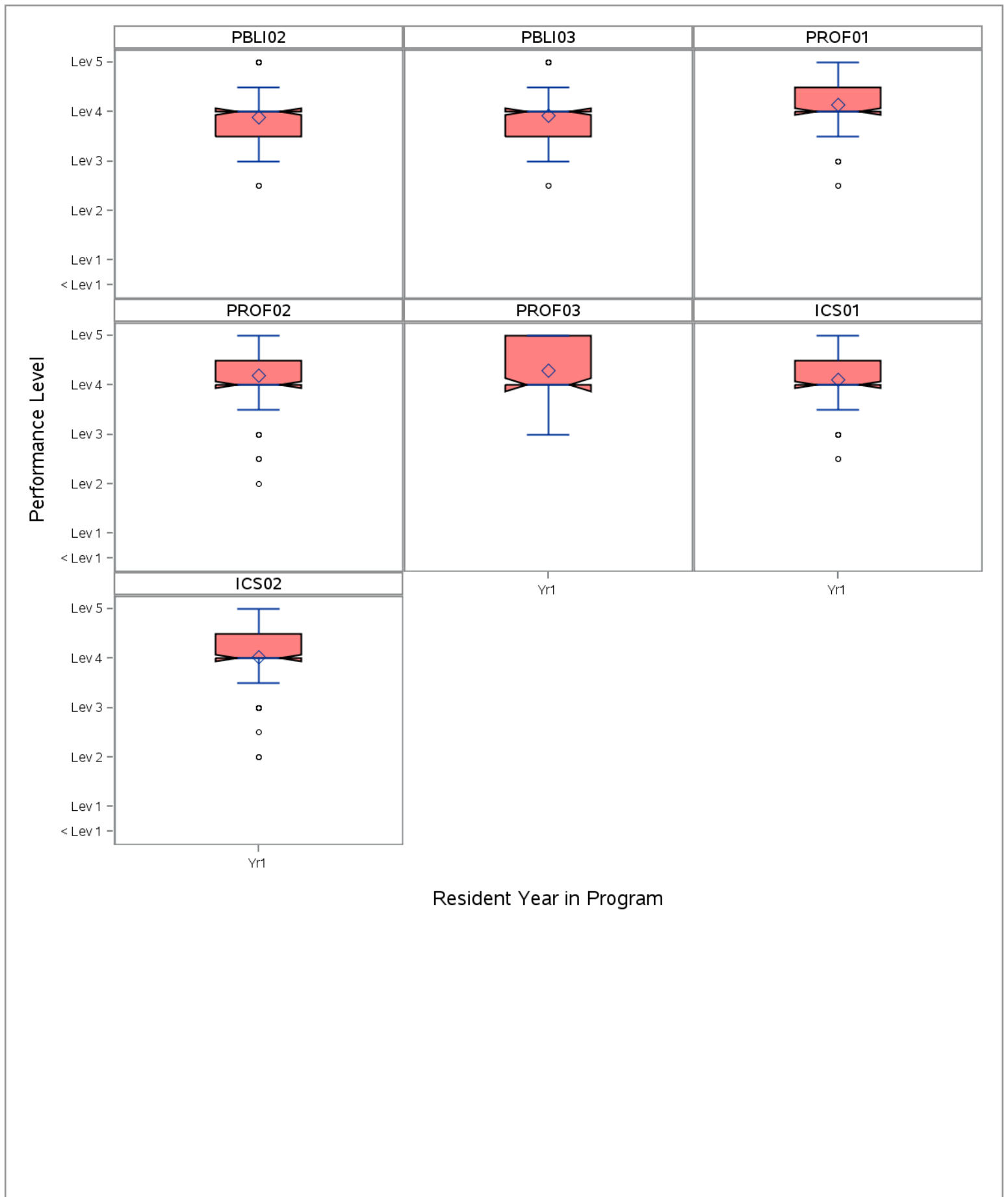
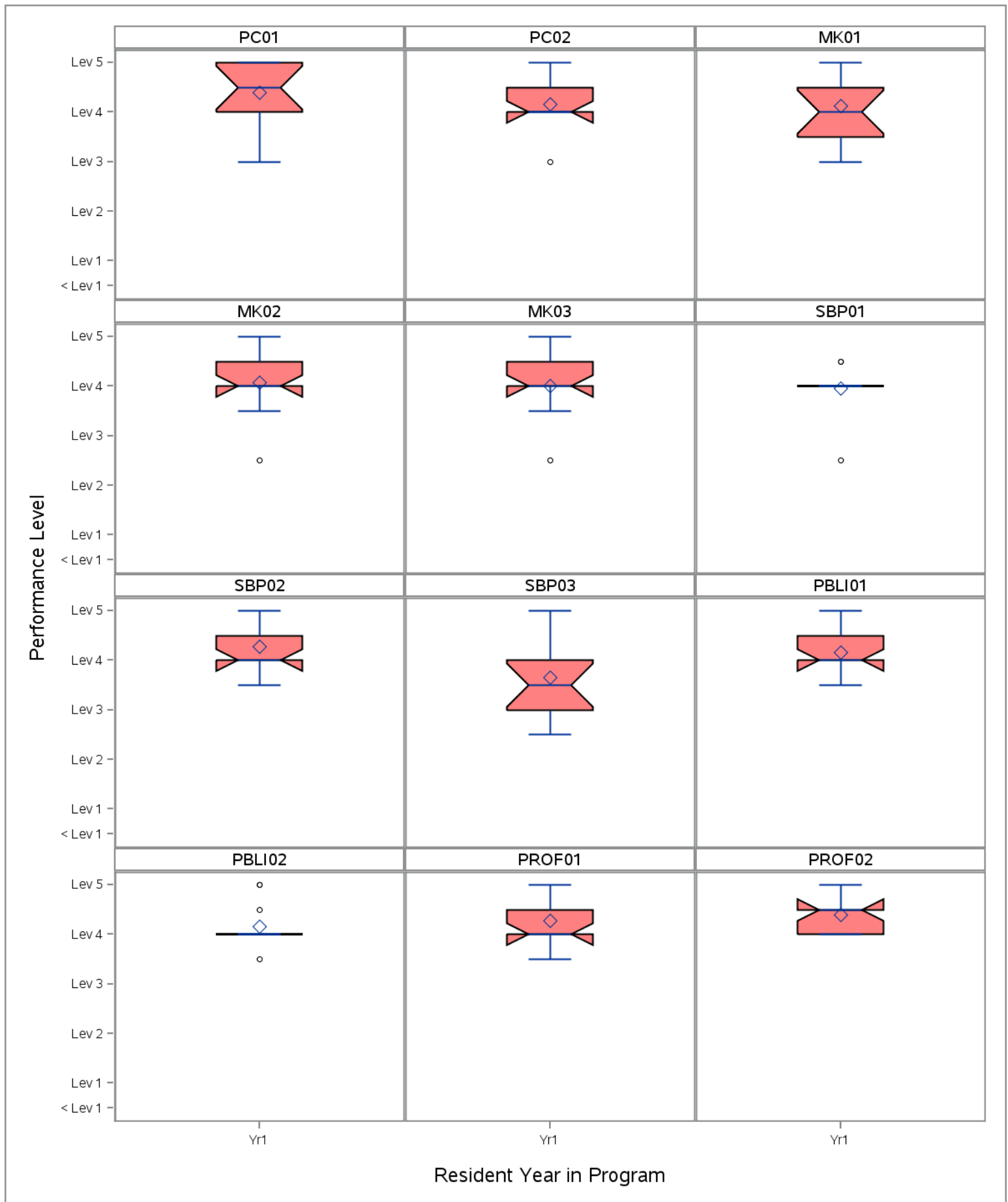


Table 80 - Medical microbiology (June 2017)



Continue to next page for Medical microbiology

Table 80 - Medical microbiology (June 2017)

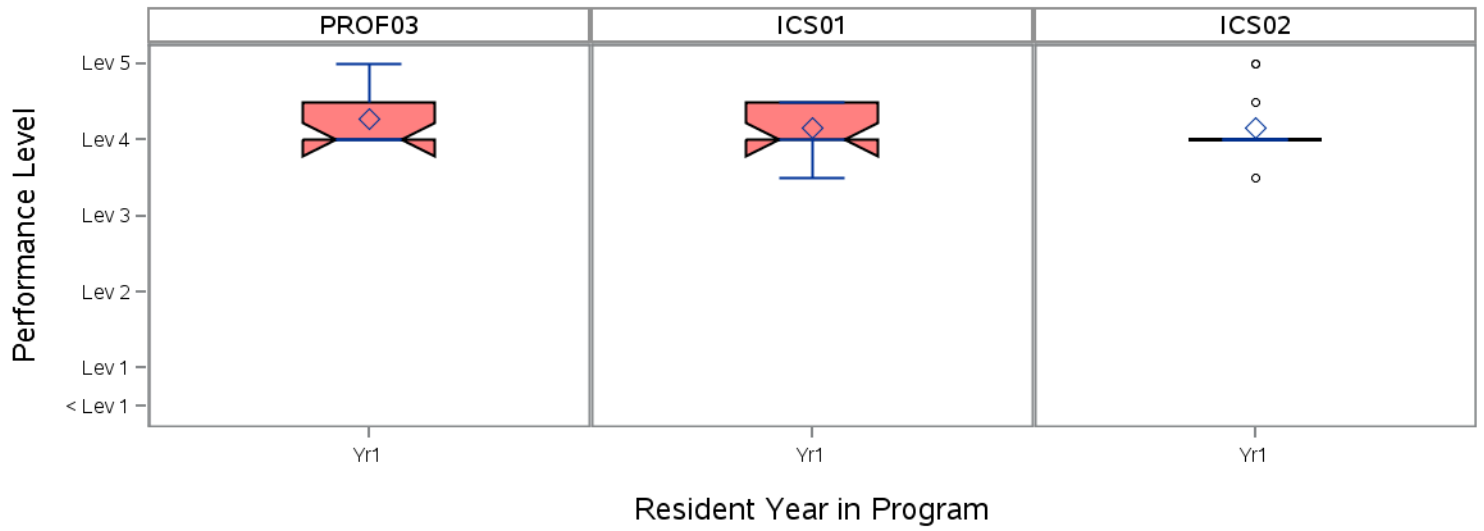
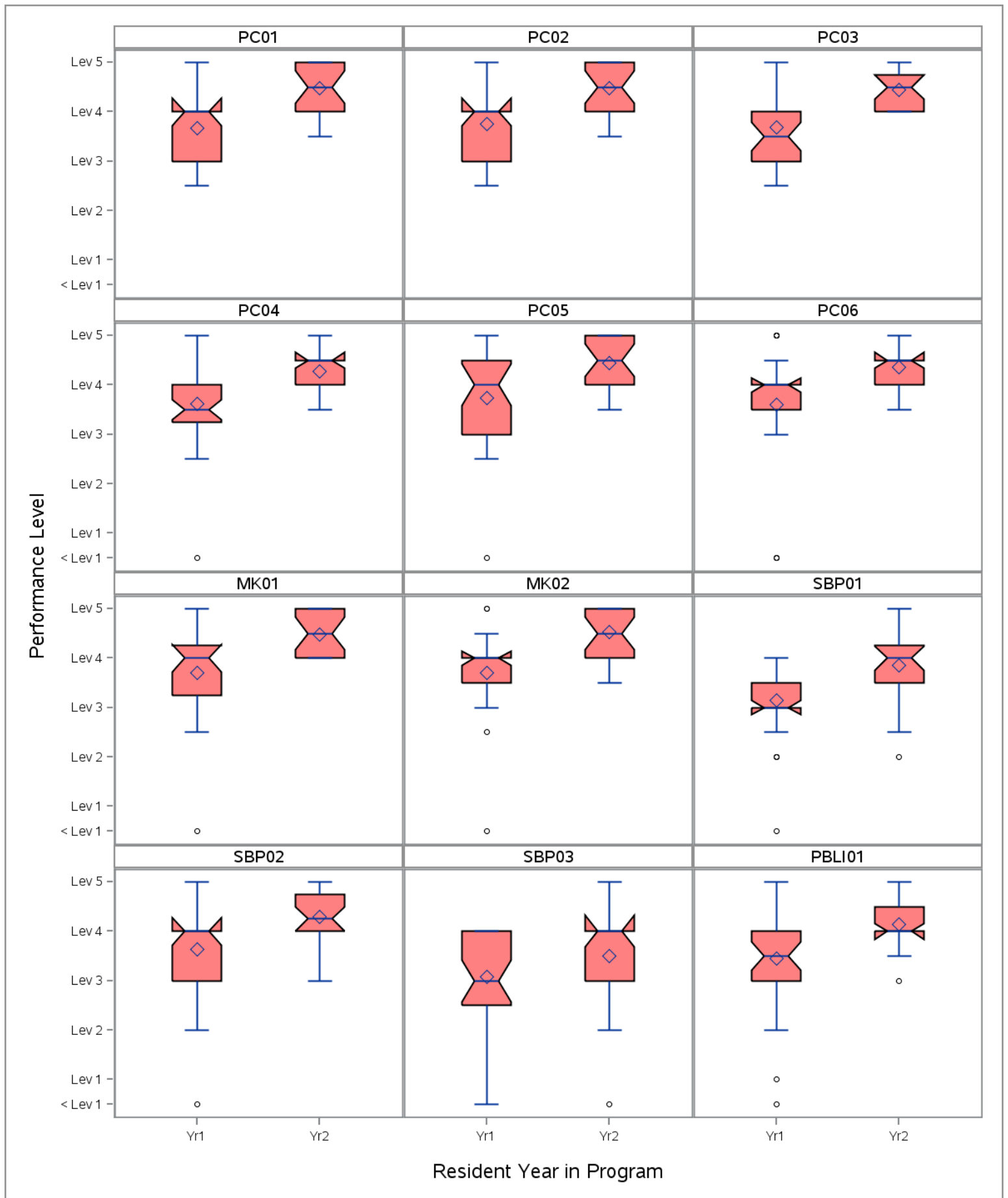


Table 81 - Neuropathology (June 2017)



Continue to next page for Neuropathology

Table 81 - Neuropathology (June 2017)

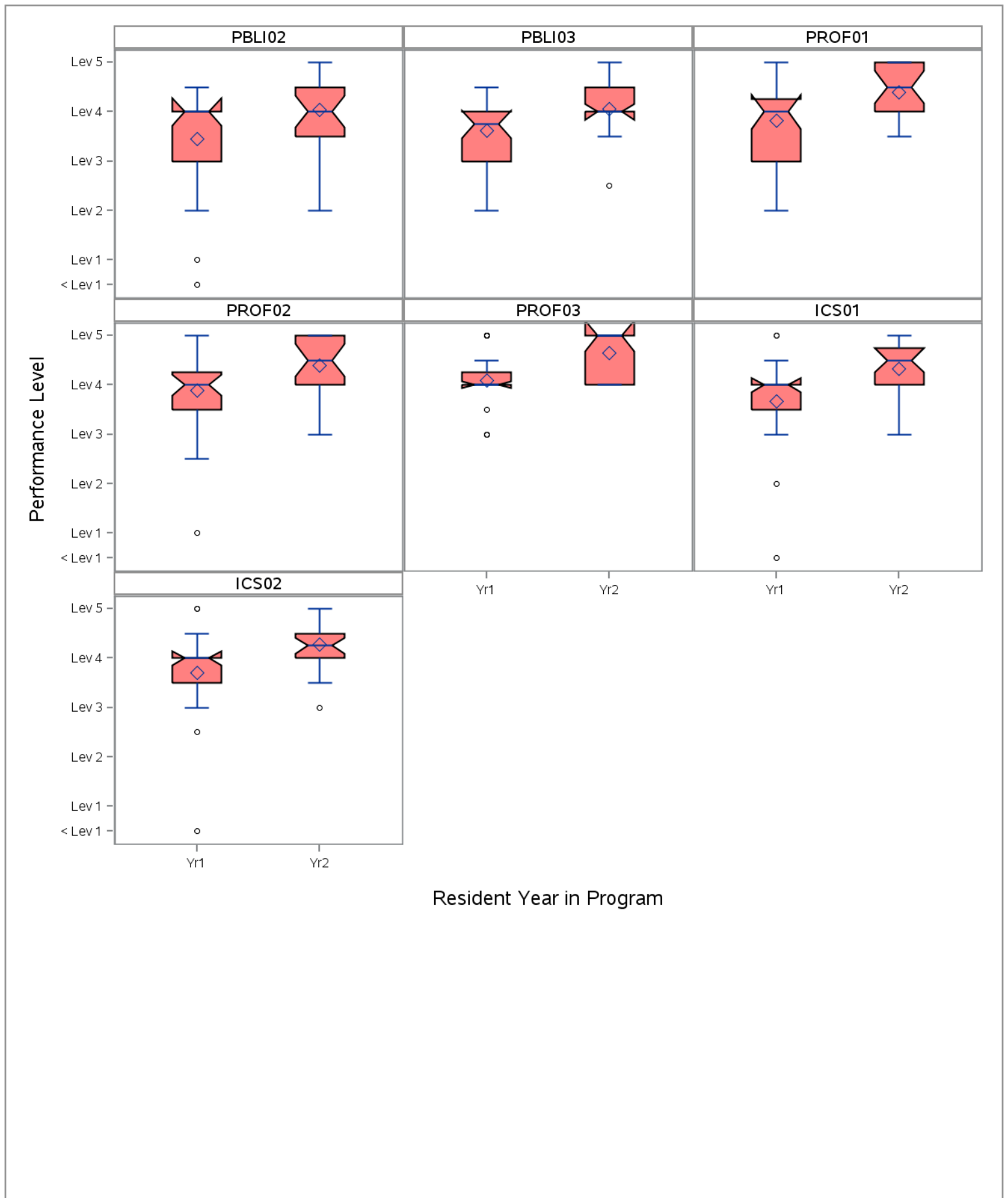
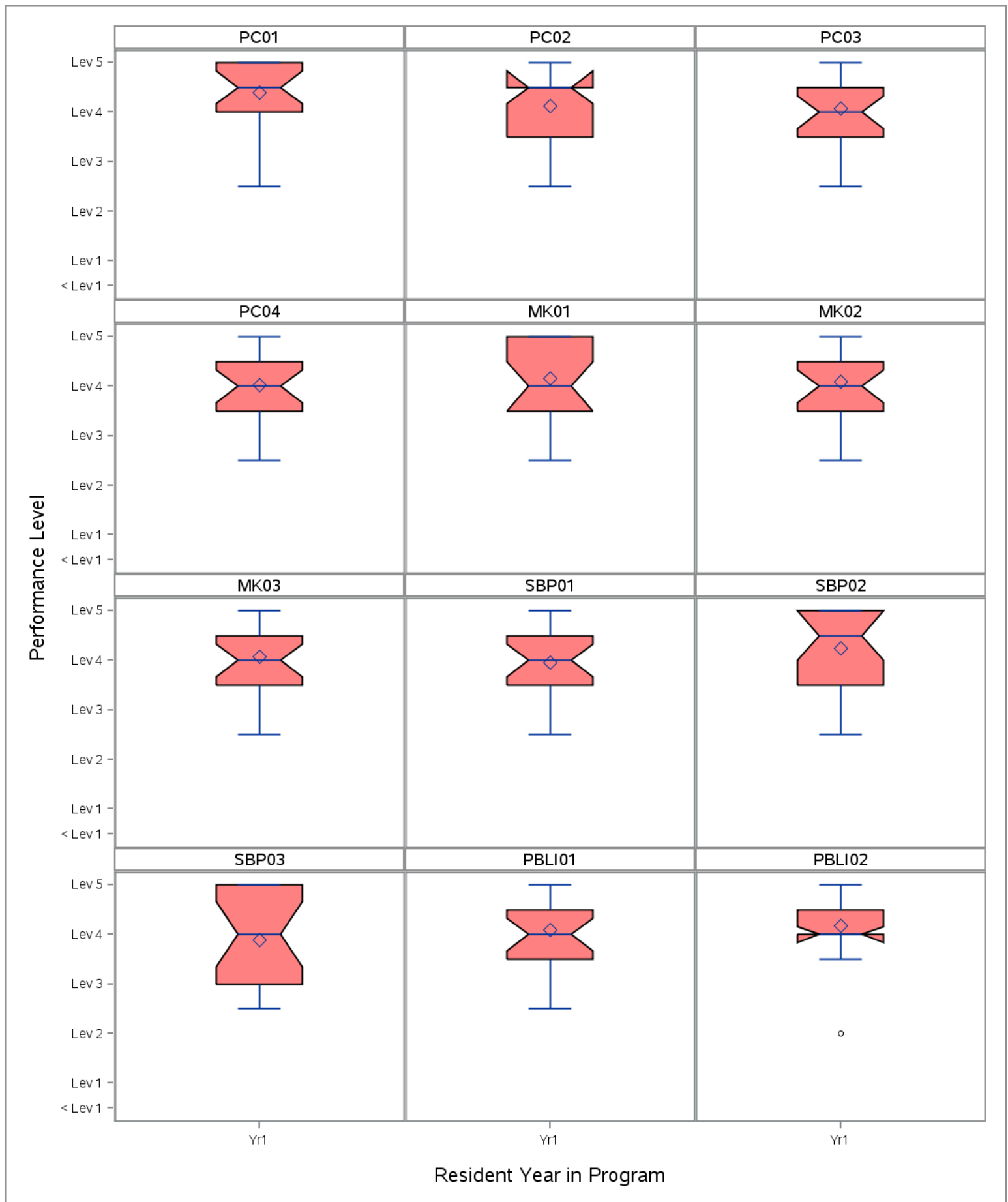


Table 82 - Pediatric pathology (June 2017)



Continue to next page for Pediatric pathology

Table 82 - Pediatric pathology (June 2017)

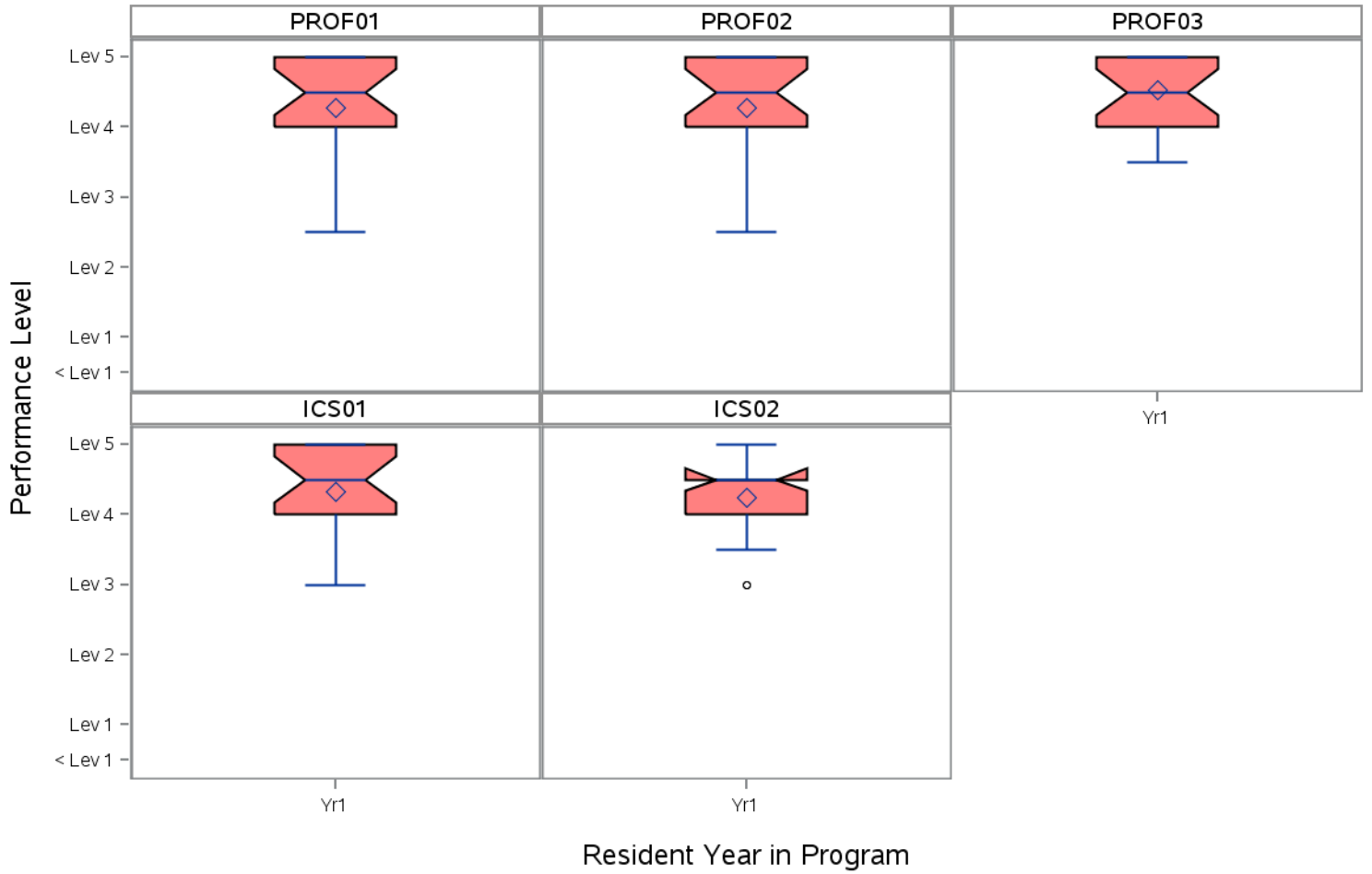
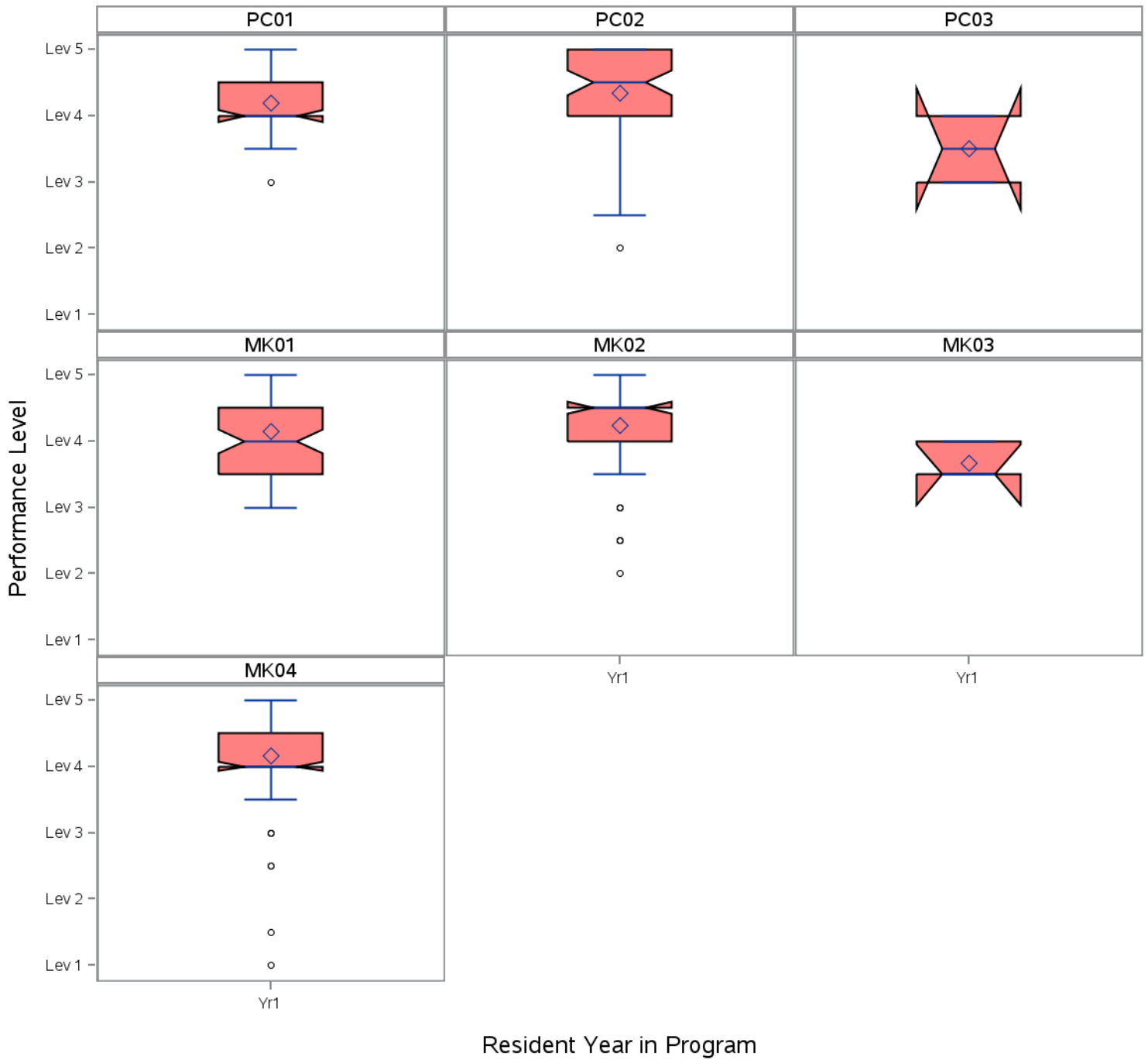
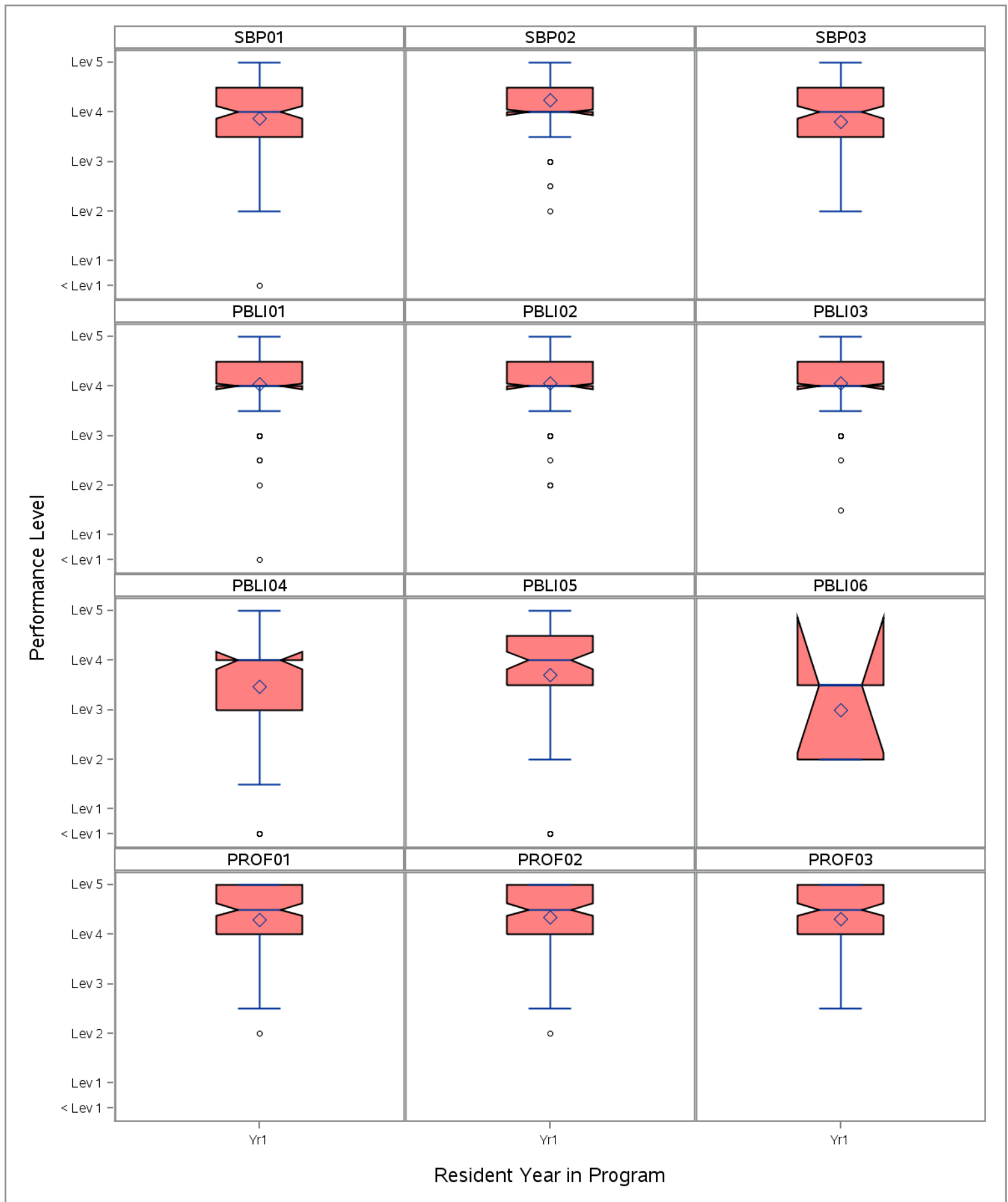


Table 83 - Selective pathology (June 2017)



Continue to next page for Selective pathology

Table 83 - Selective pathology (June 2017)



Continue to next page for Selective pathology

Table 83 - Selective pathology (June 2017)

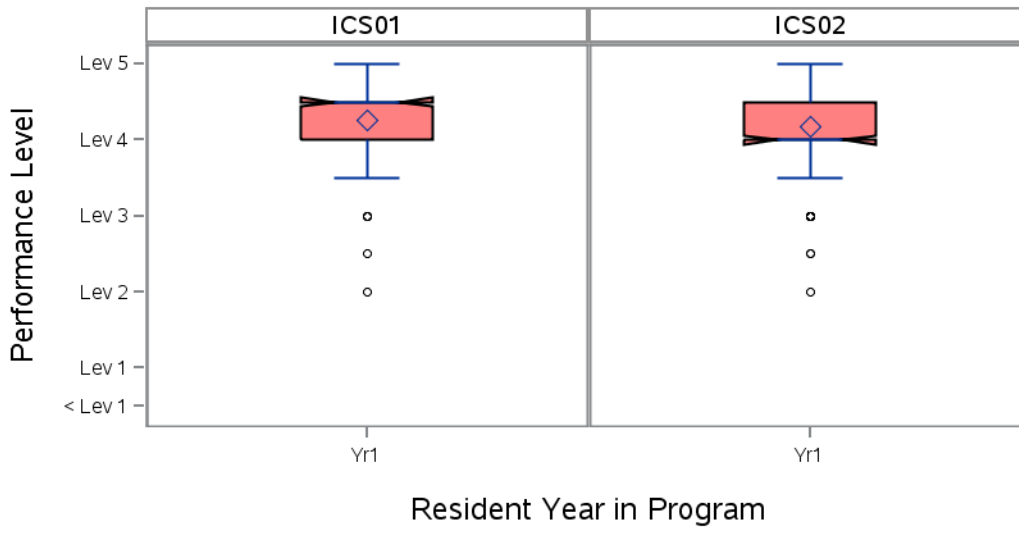
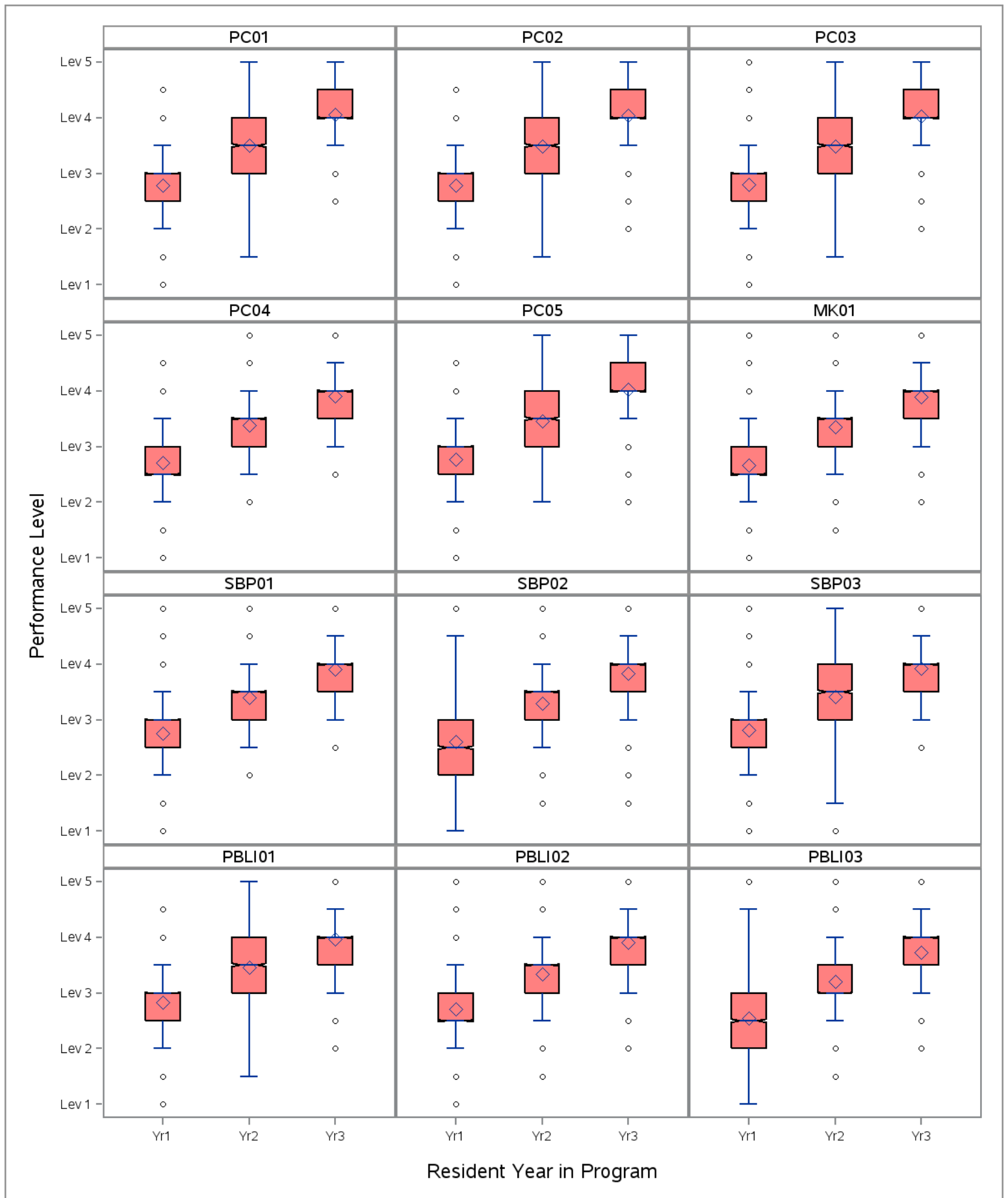


Table 84 - Pediatrics (June 2017)



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Table 84 - Pediatrics (June 2017)

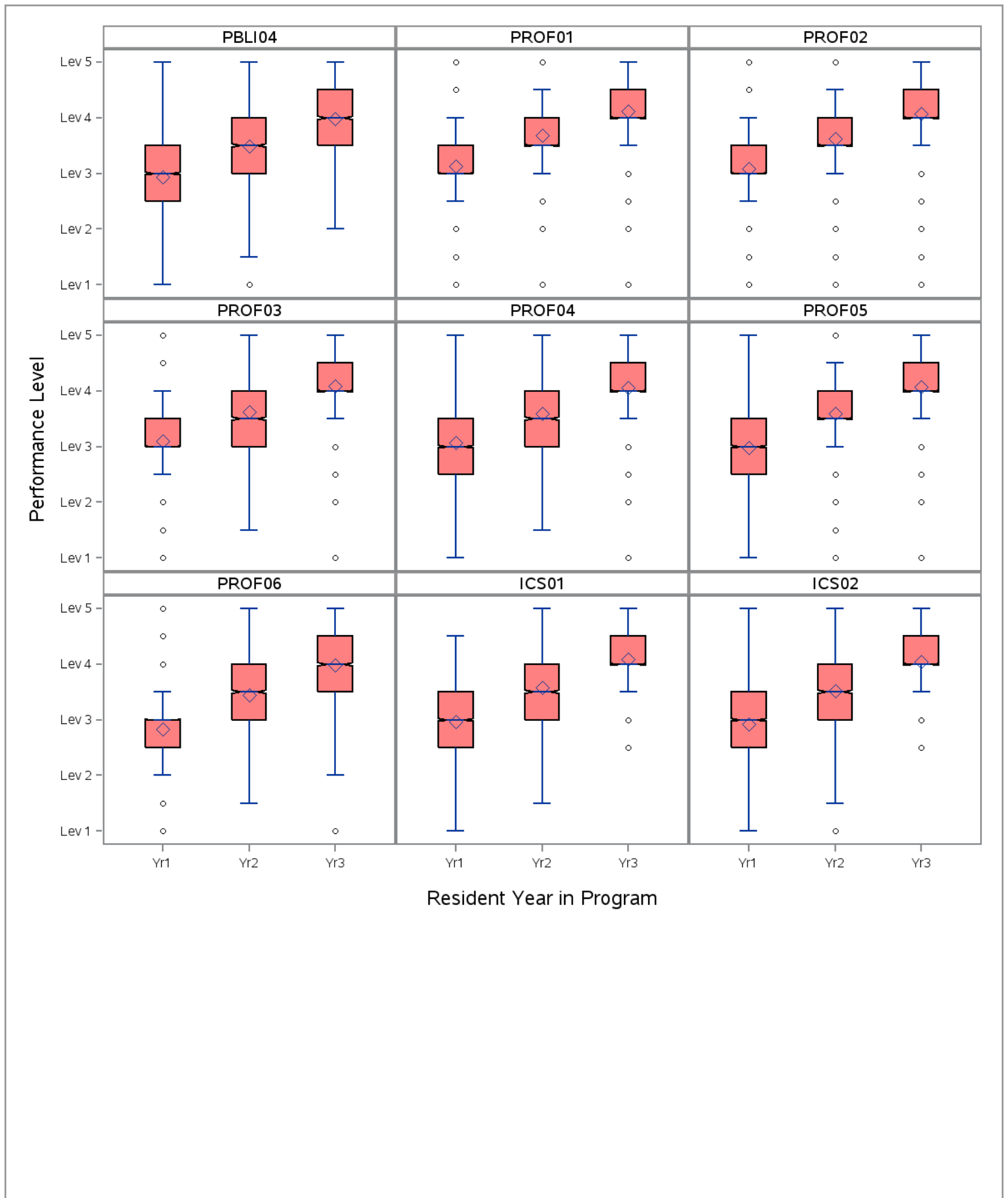
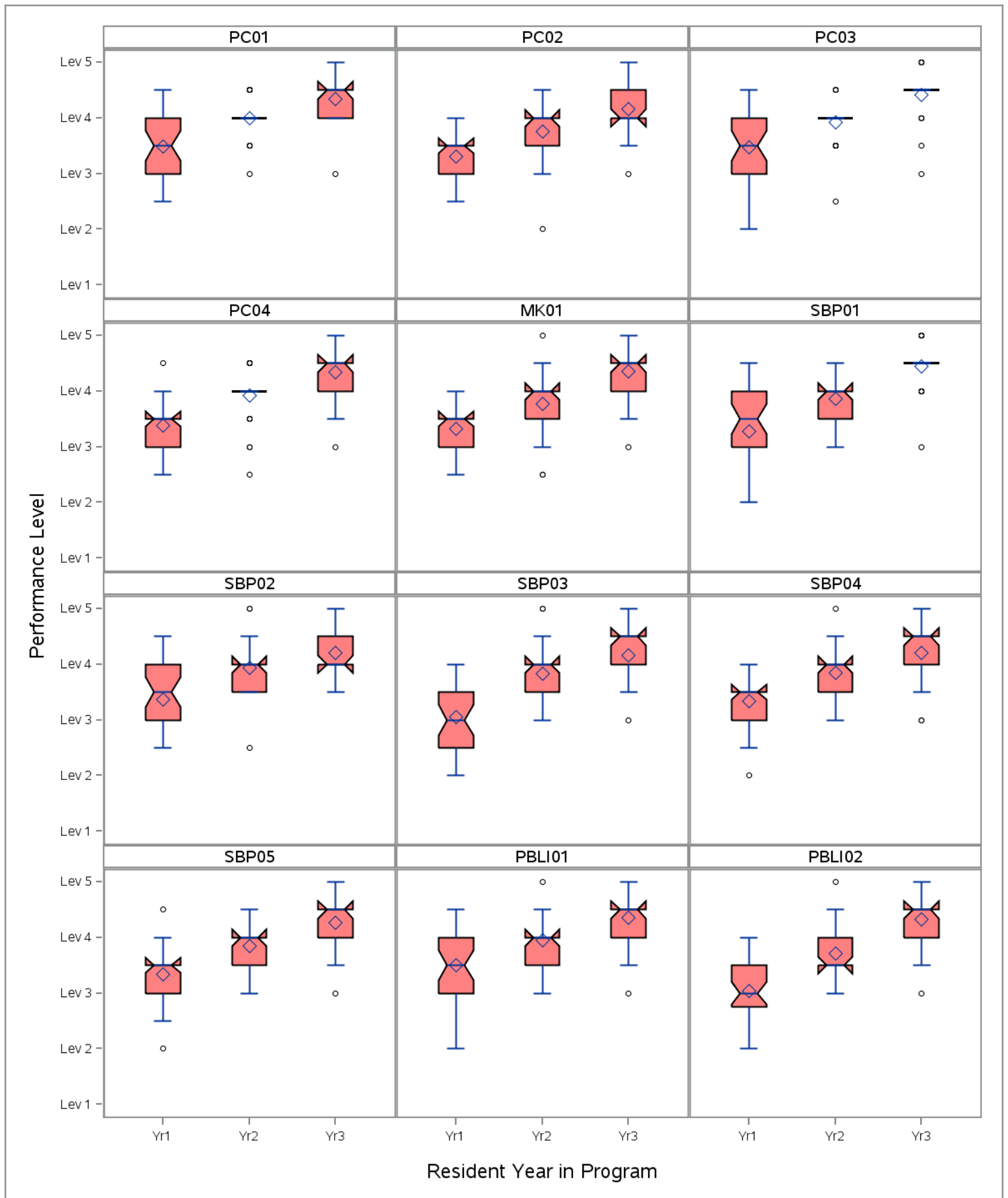


Table 85 - Adolescent medicine (June 2017)



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Table 85 - Adolescent medicine (June 2017)

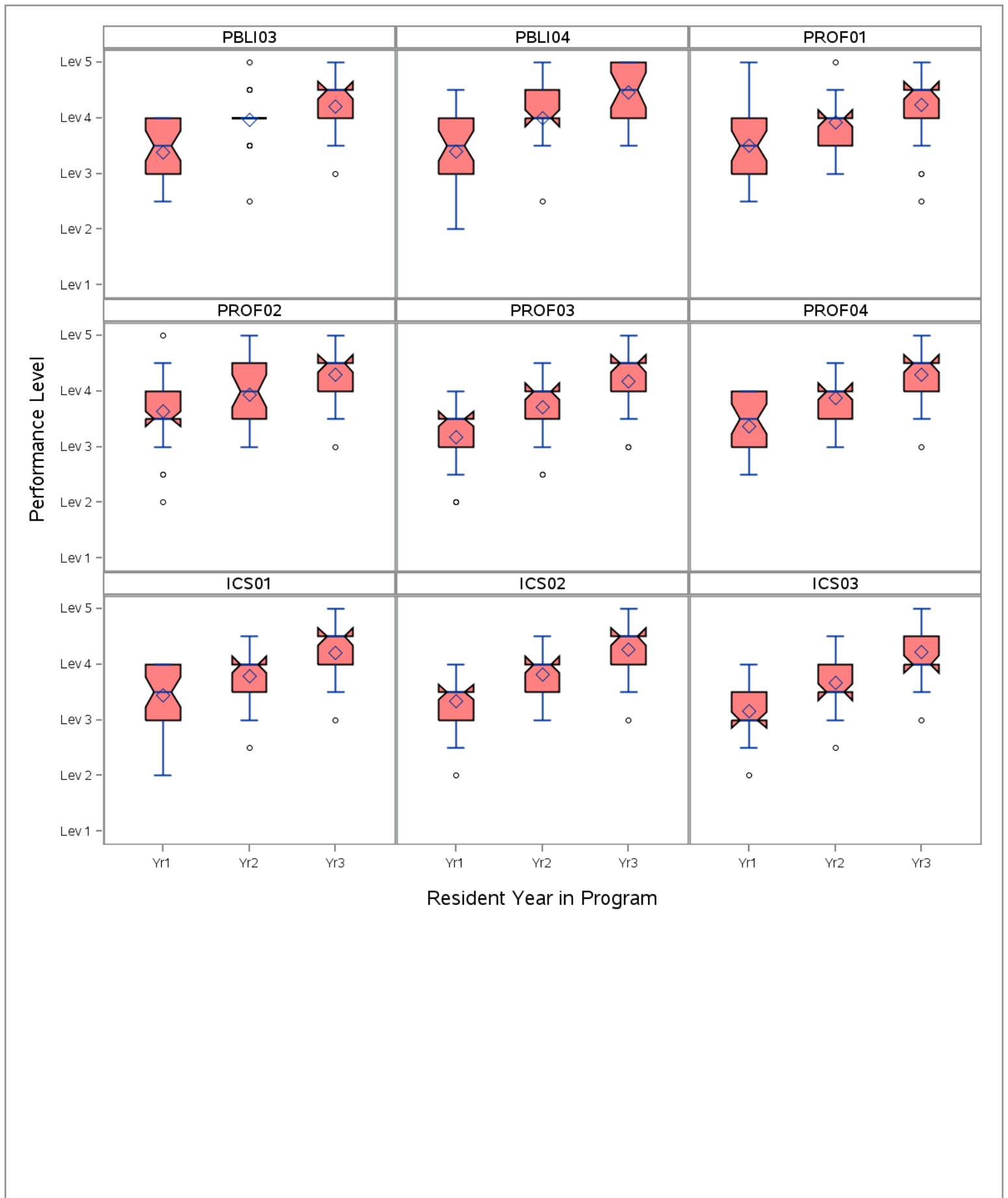
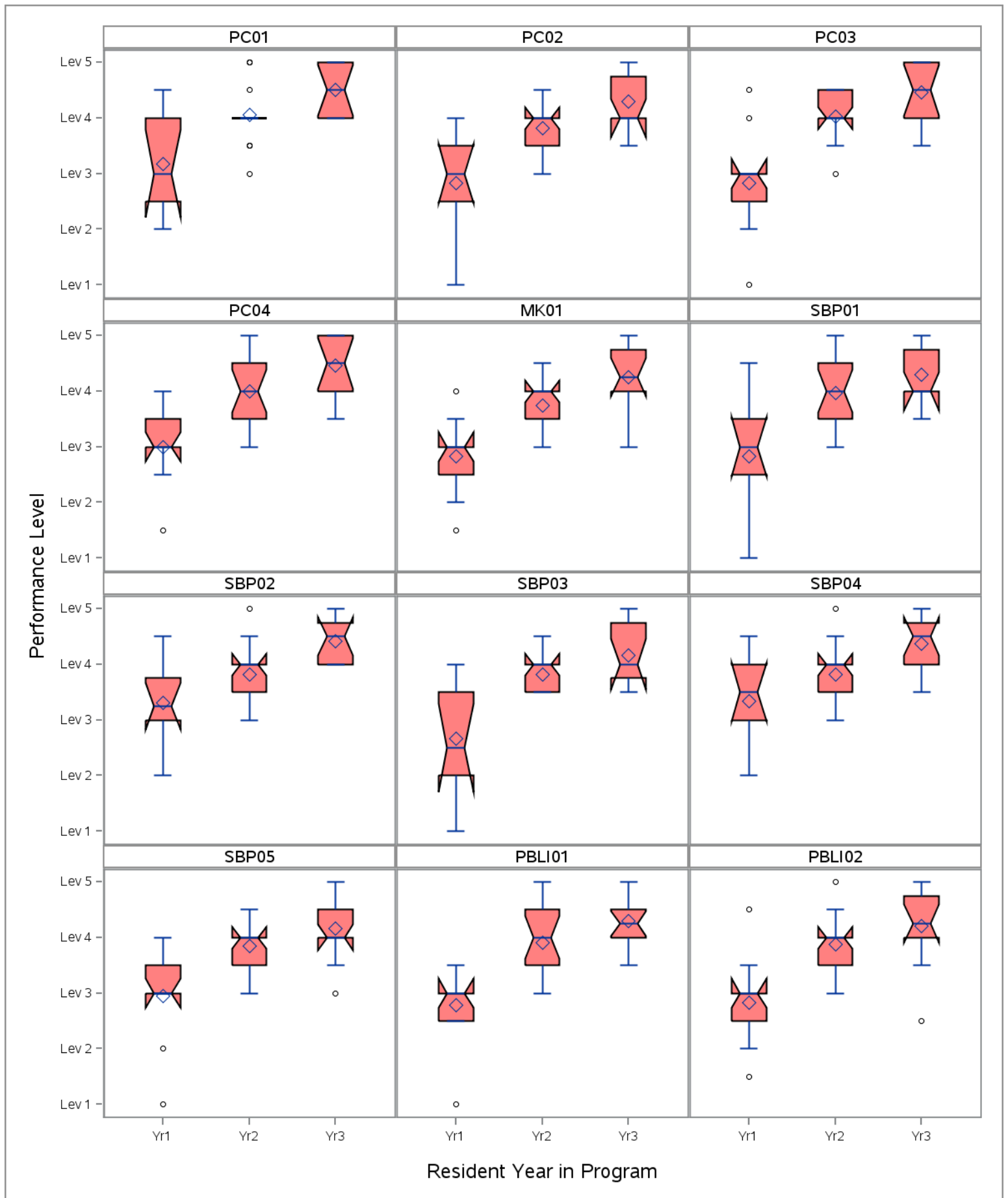


Table 86 - Child abuse pediatrics (June 2017)



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Table 86 - Child abuse pediatrics (June 2017)

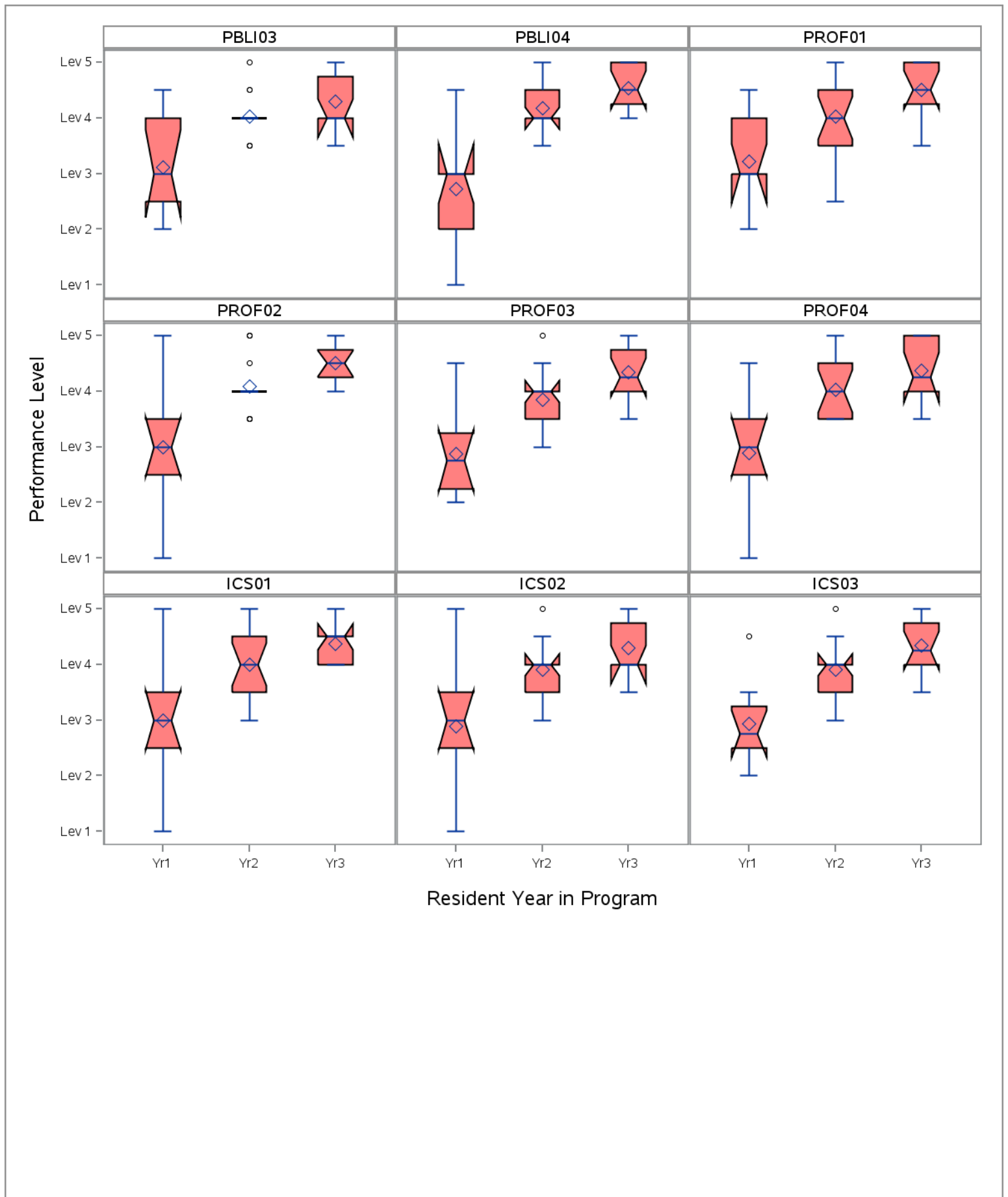
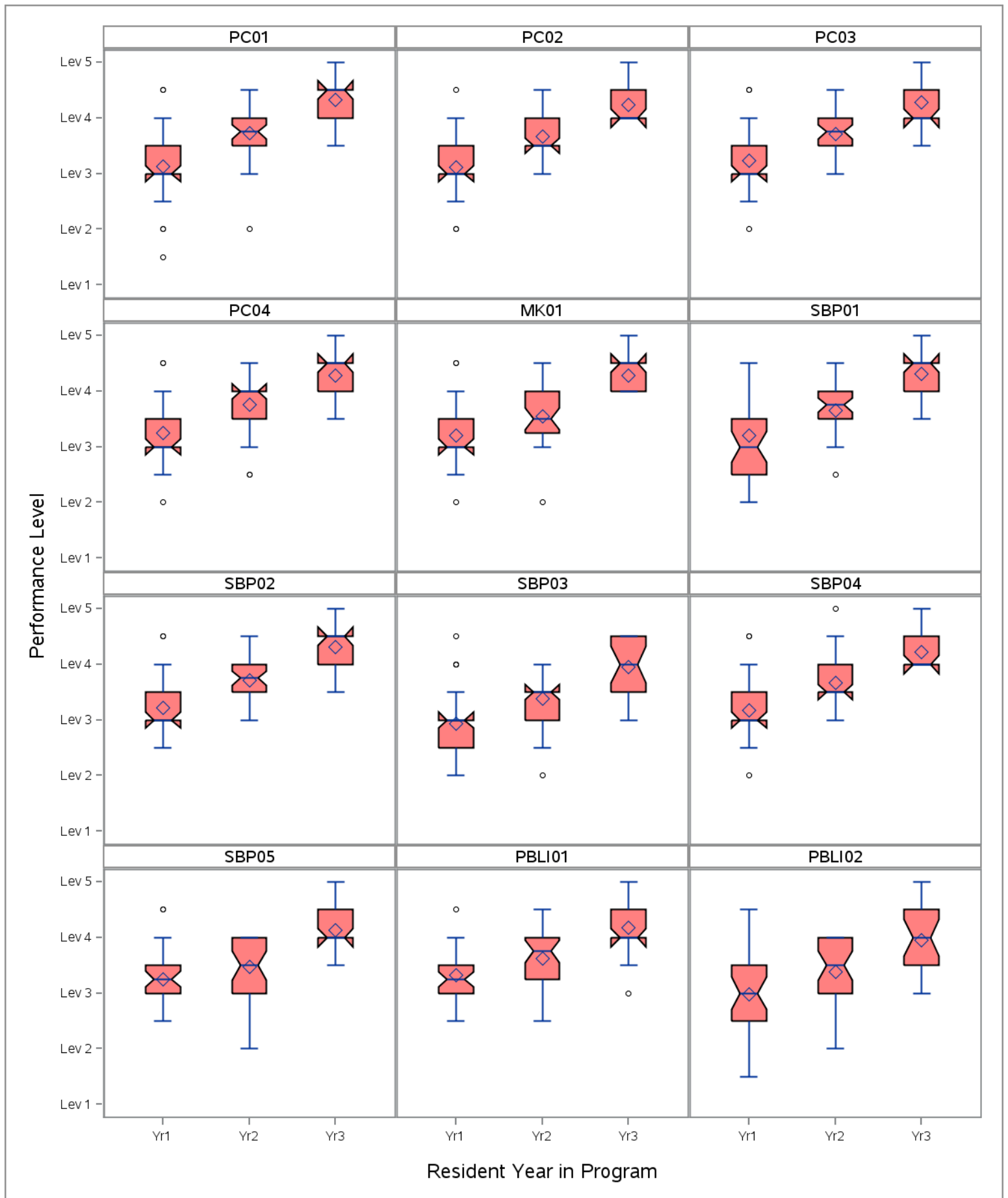


Table 87 - Developmental-behavioral pediatrics (June 2017)



Continue to next page for Developmental-behavioral pediatrics

Table 87 - Developmental-behavioral pediatrics (June 2017)

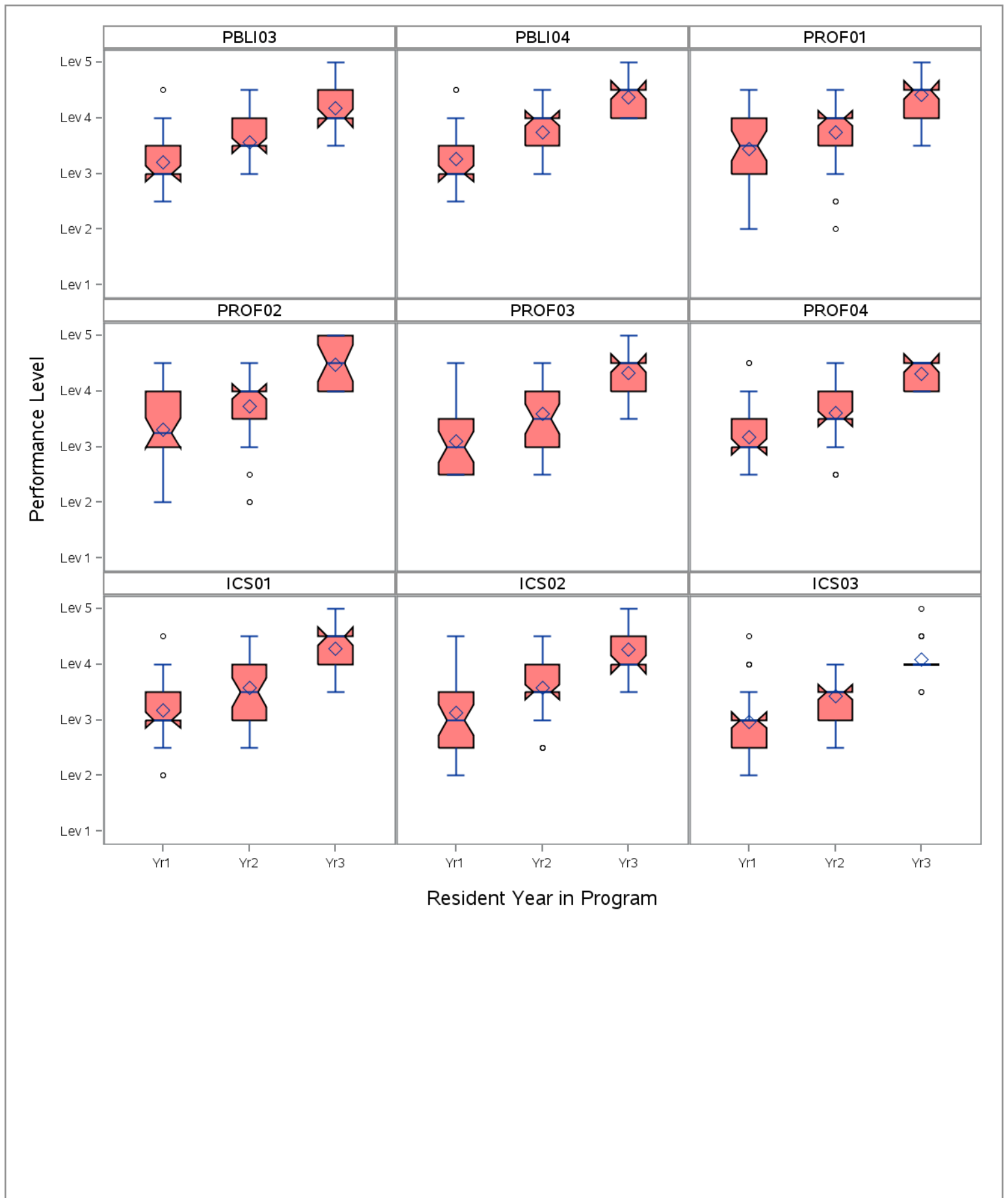
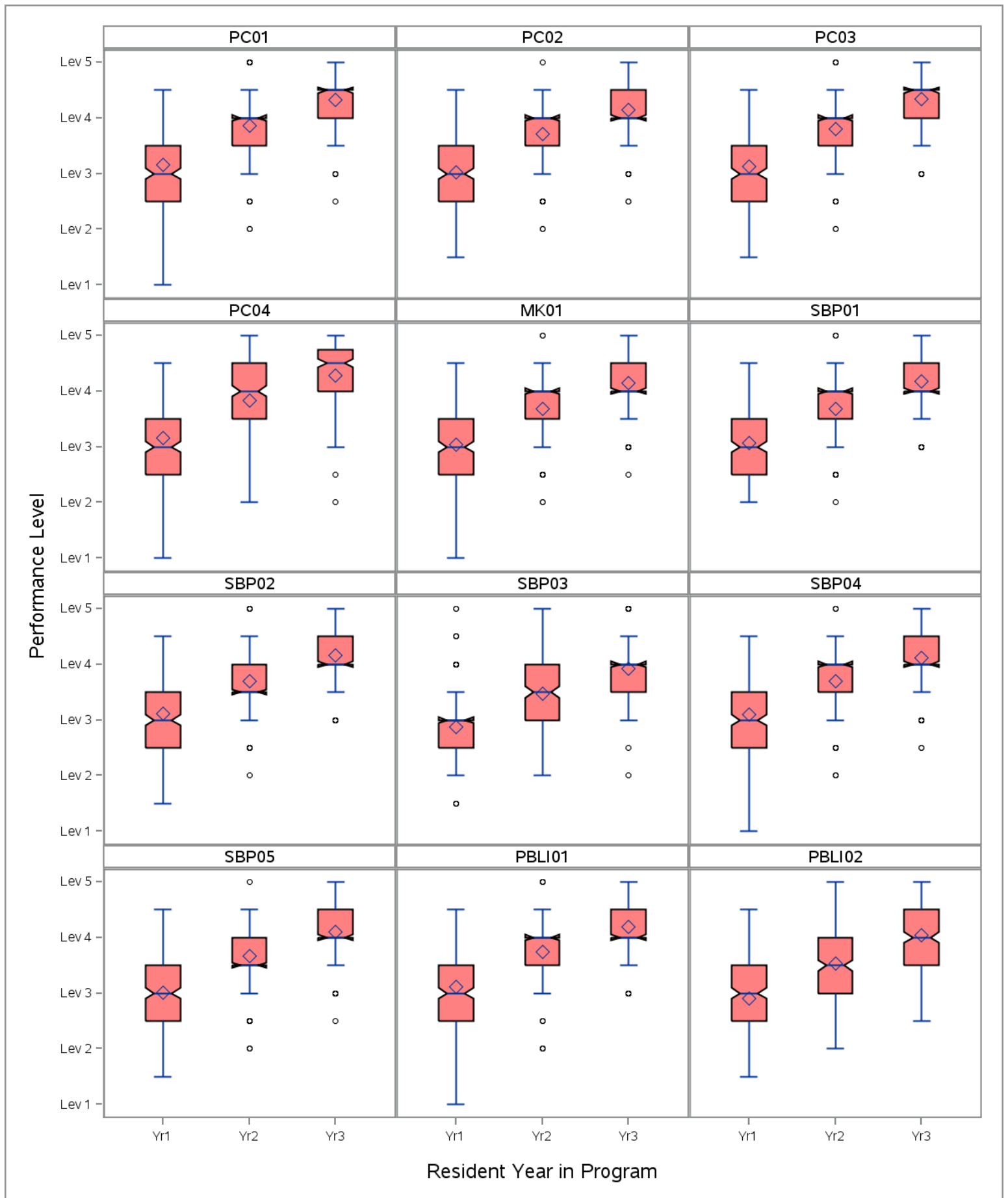


Table 88 - Neonatal-perinatal medicine (June 2017)



Continue to next page for Neonatal-perinatal medicine

Table 88 - Neonatal-perinatal medicine (June 2017)

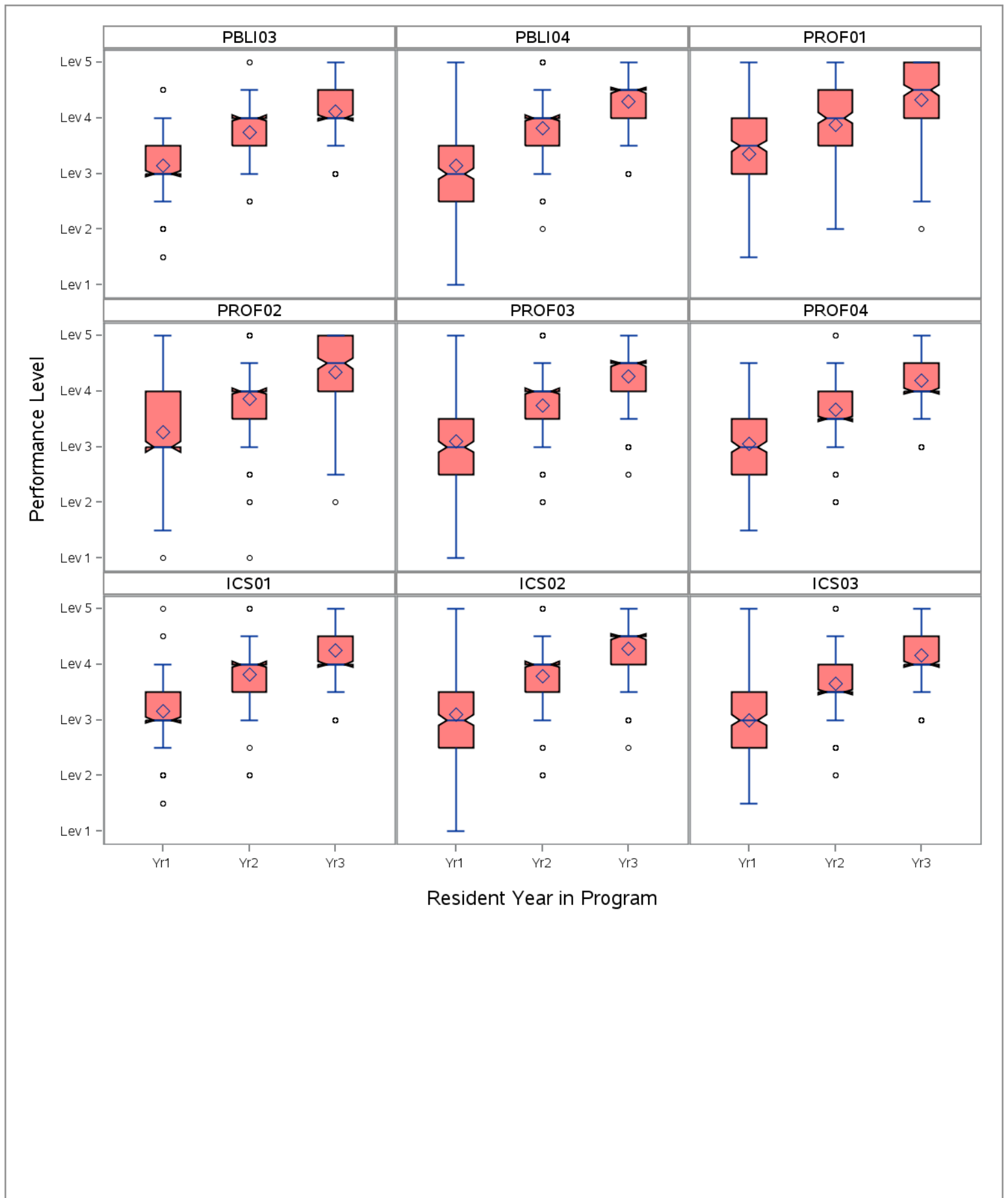
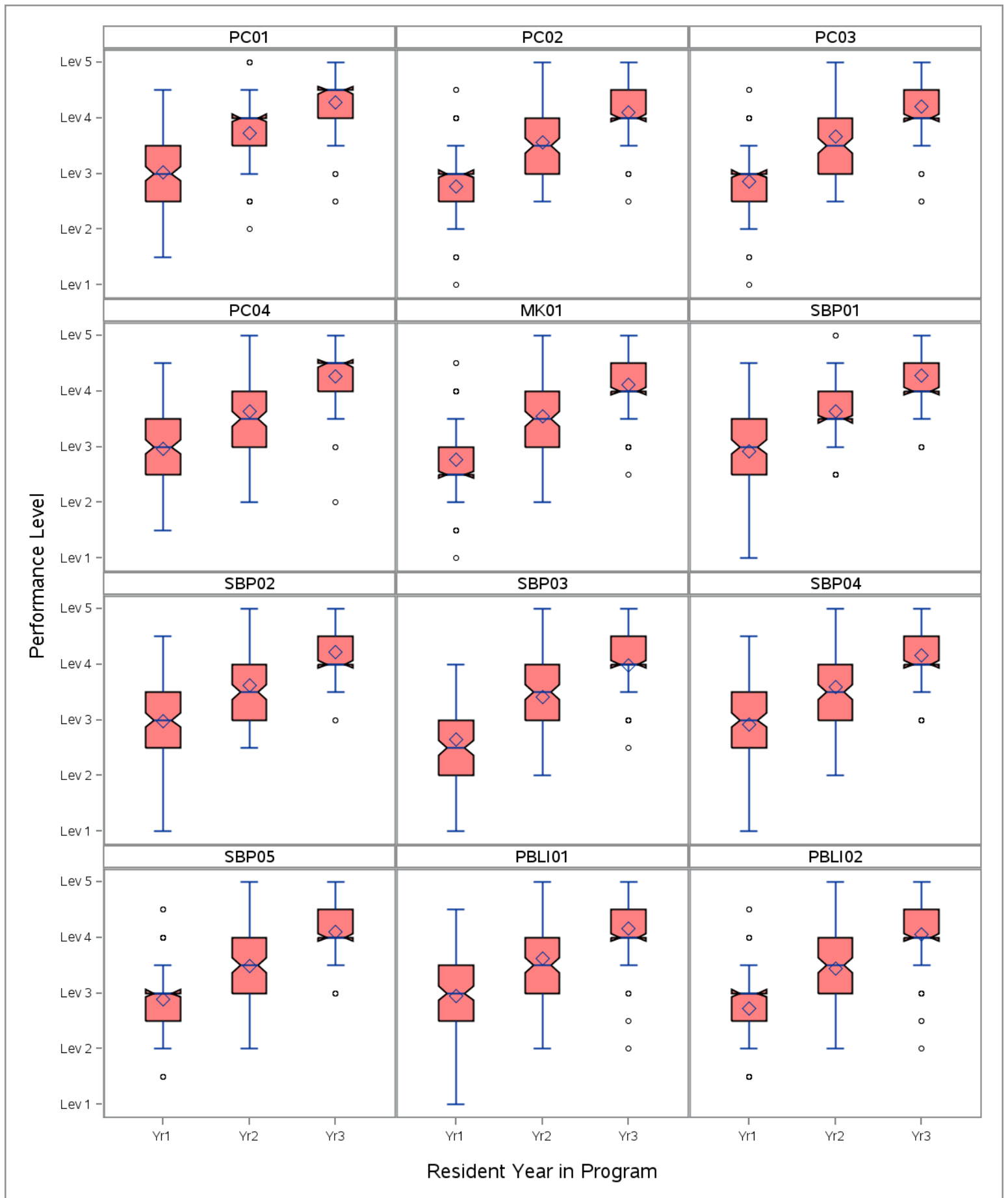


Table 89 - Pediatric cardiology (June 2017)



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Table 89 - Pediatric cardiology (June 2017)

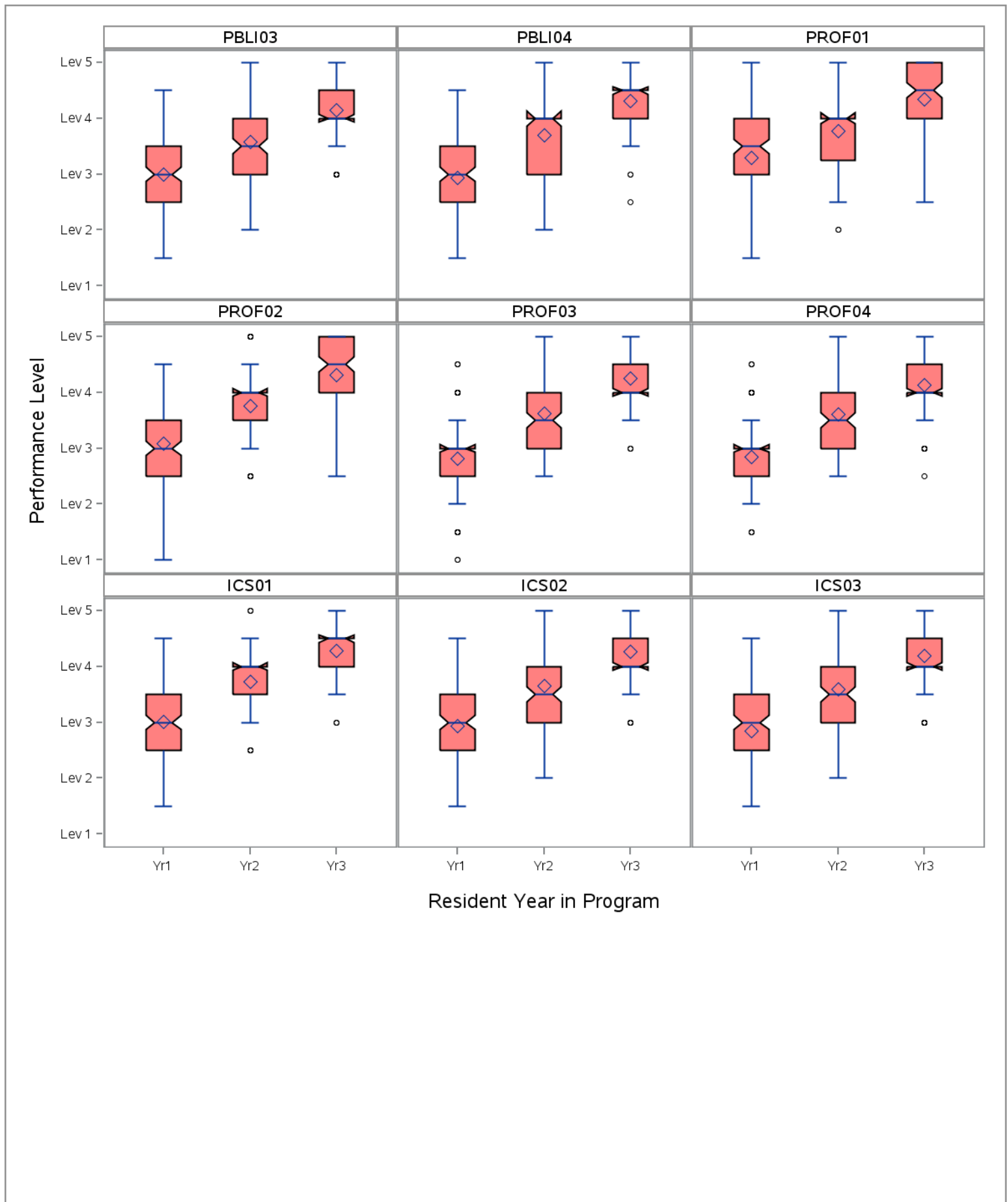
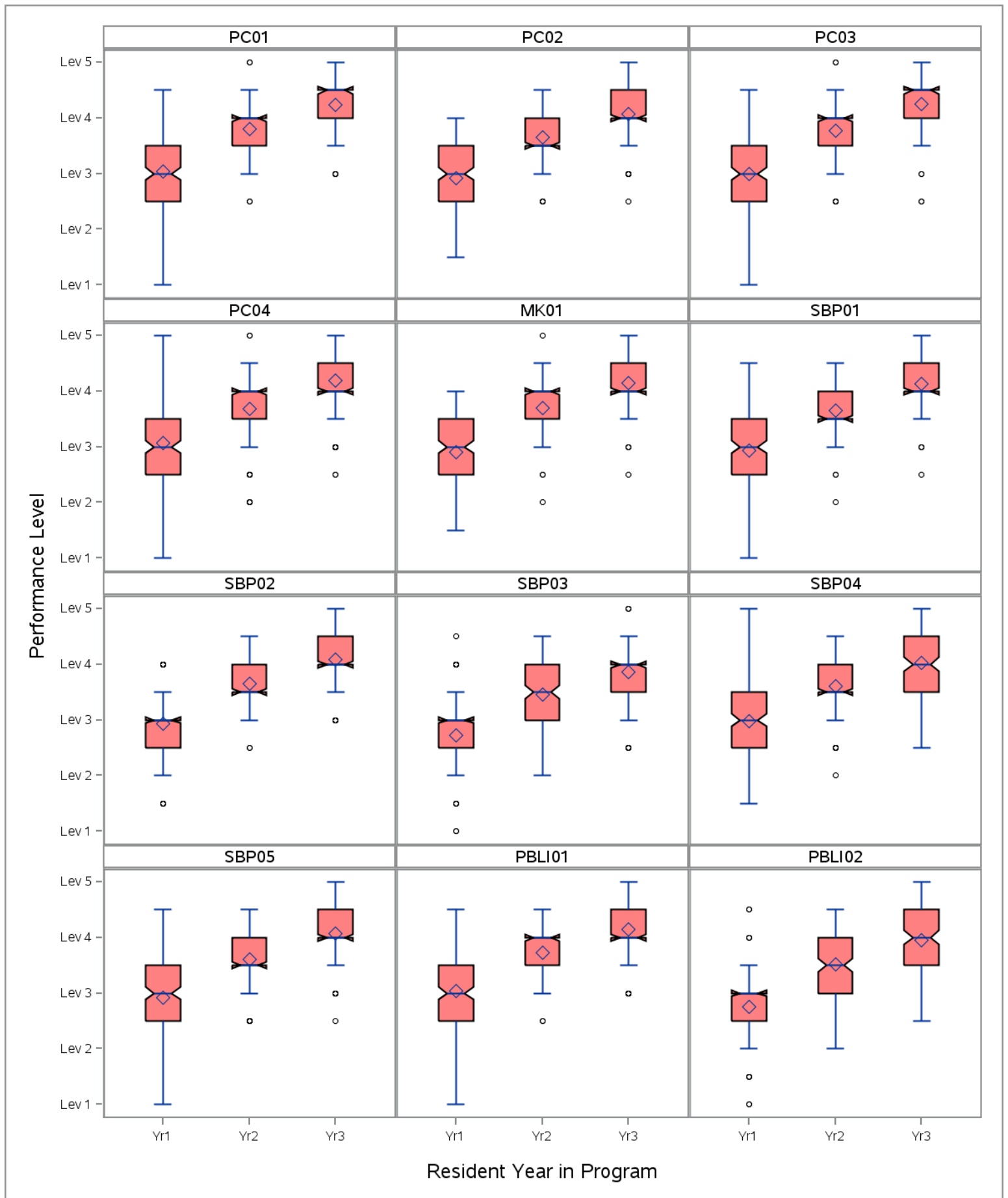


Table 90 - Pediatric critical care medicine (June 2017)



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Table 90 - Pediatric critical care medicine (June 2017)

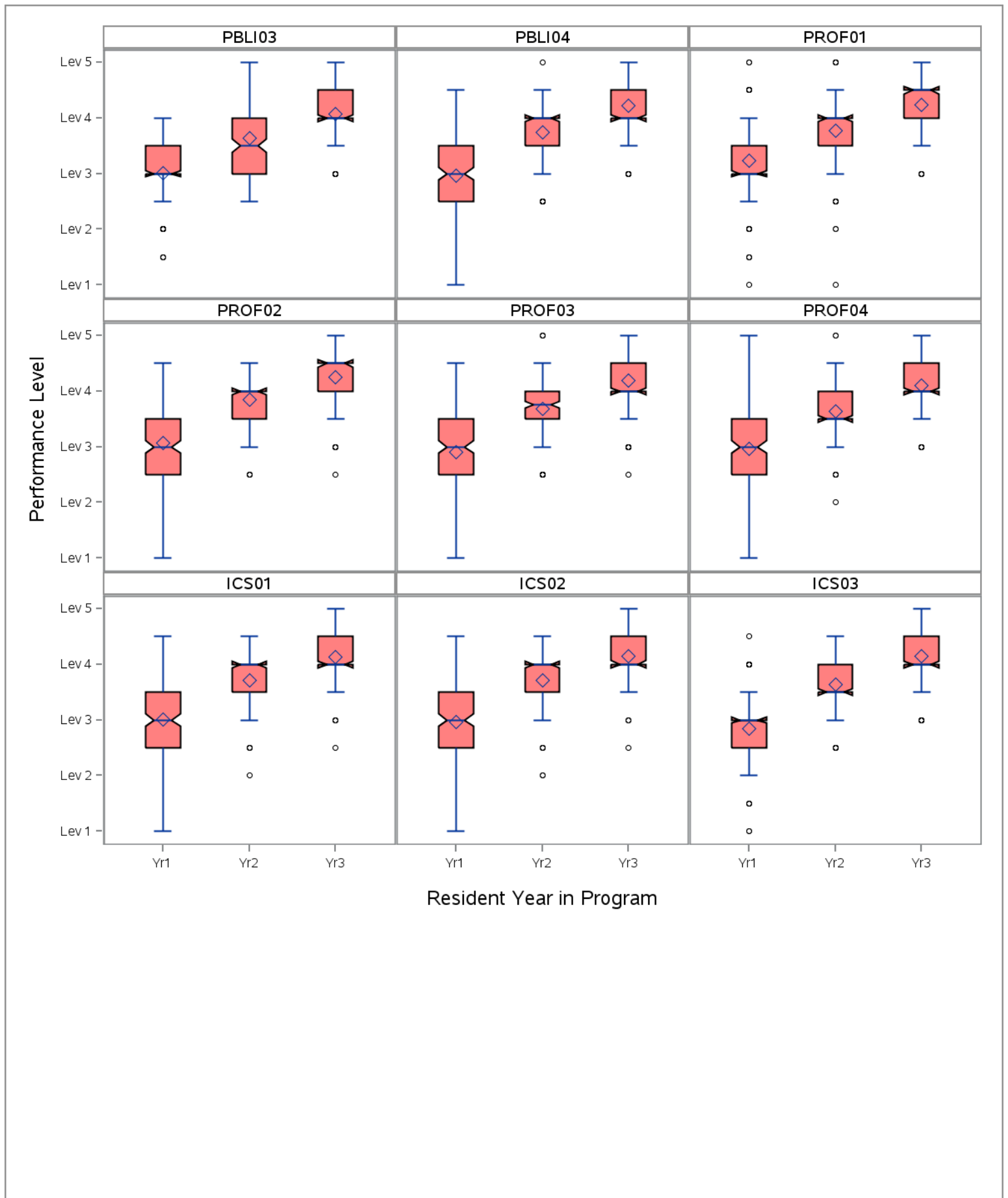
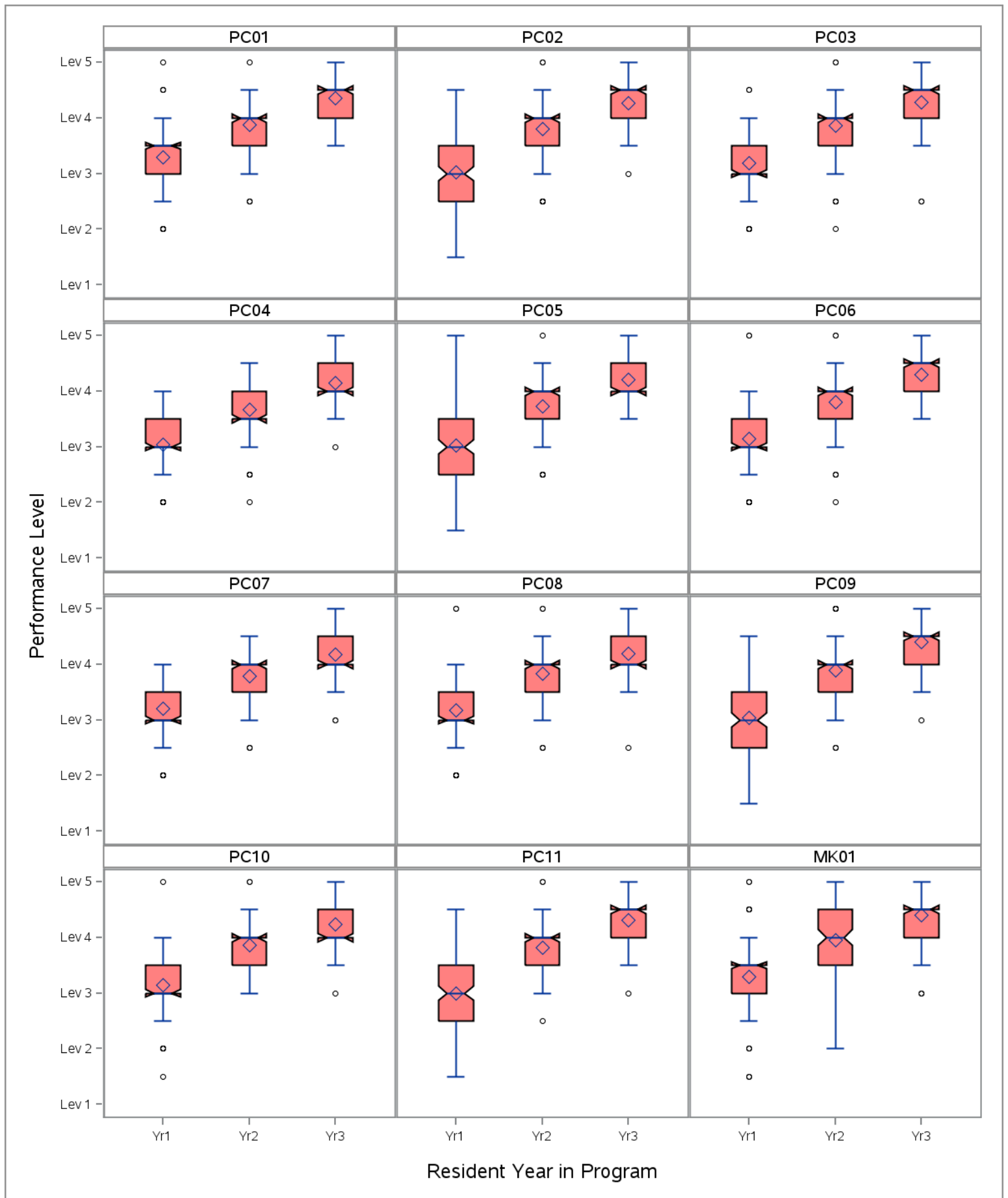


Table 91 - Pediatric emergency medicine (June 2017)



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Table 91 - Pediatric emergency medicine (June 2017)

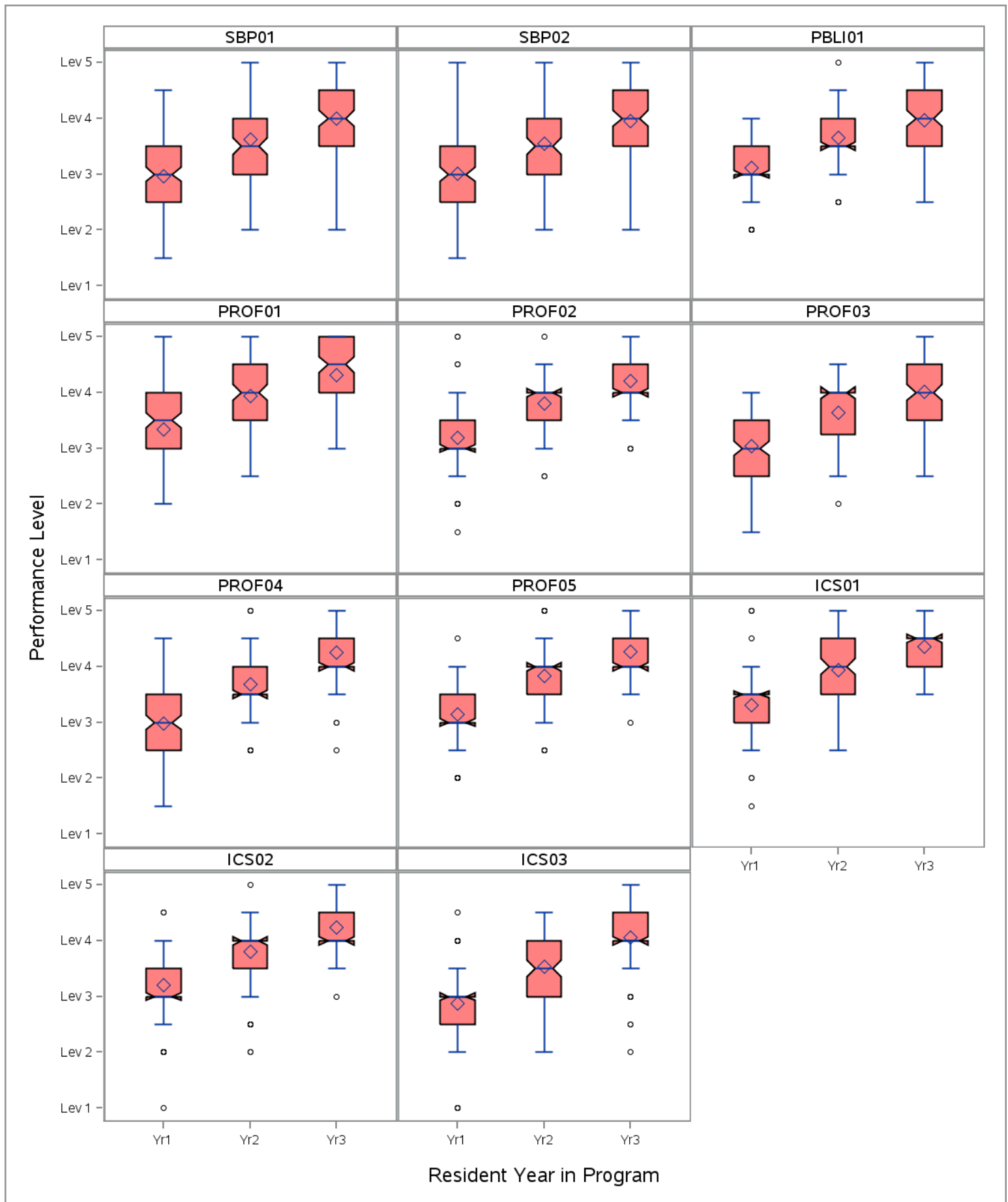
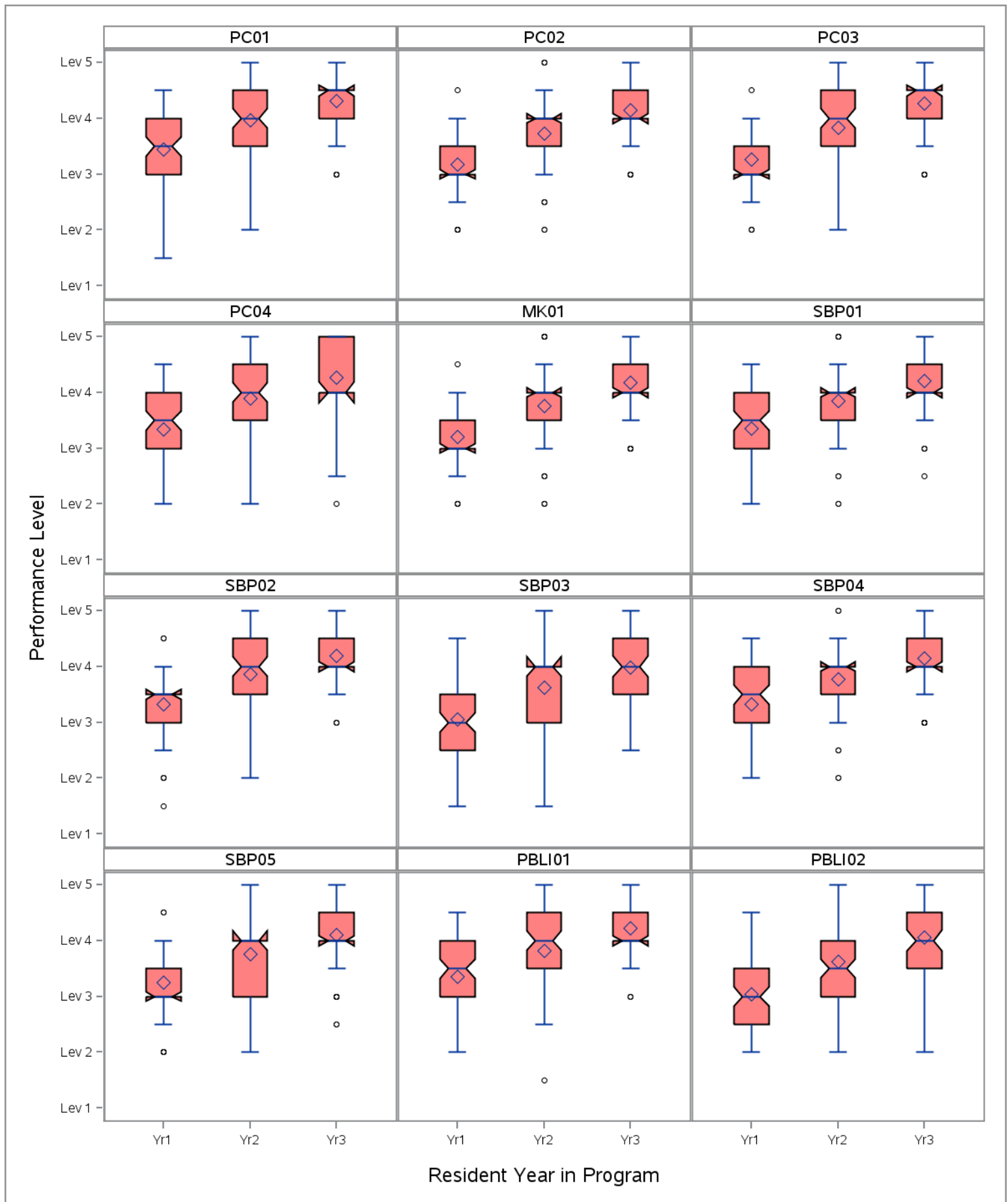


Table 92 - Pediatric endocrinology (June 2017)



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Table 92 - Pediatric endocrinology (June 2017)

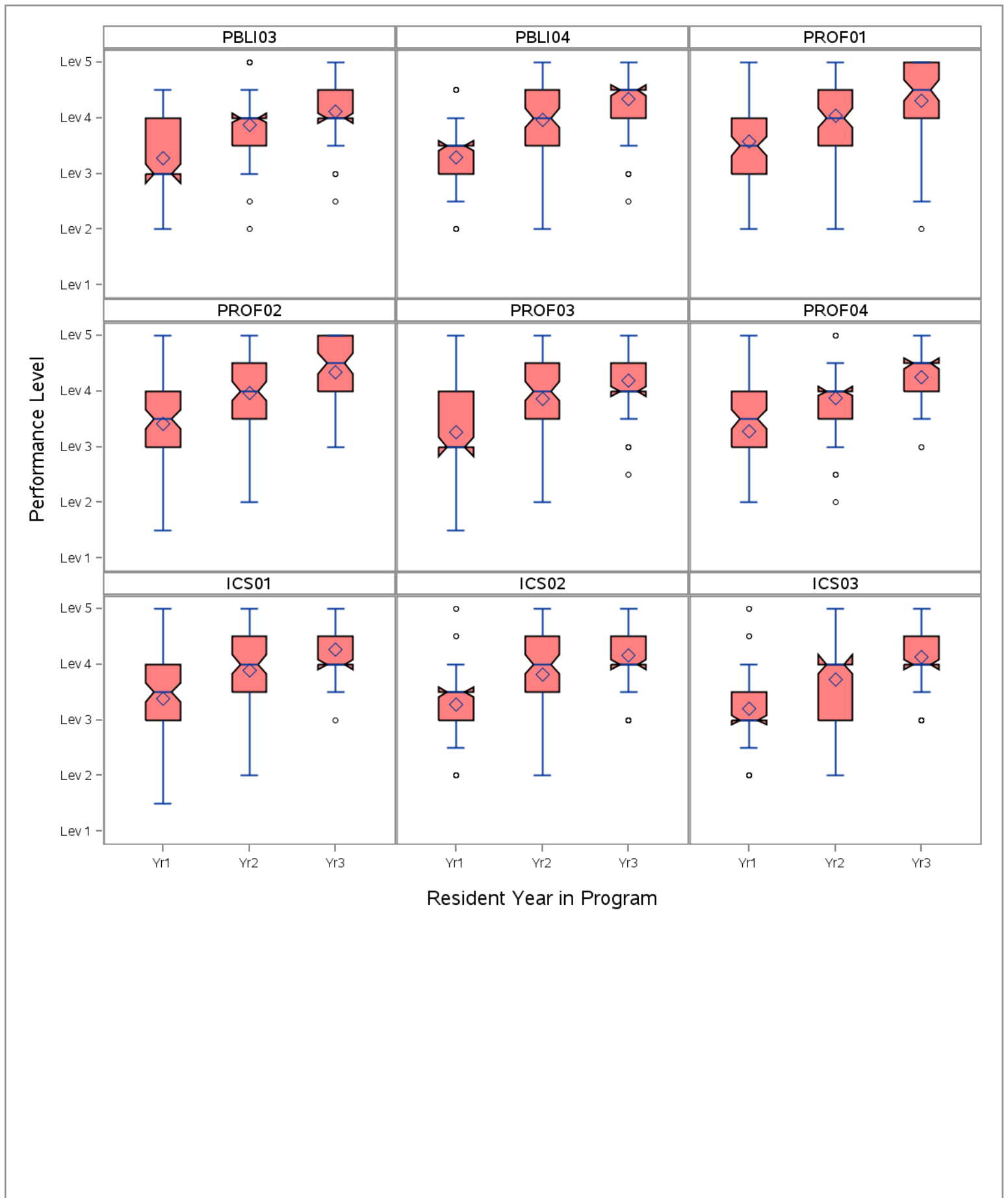
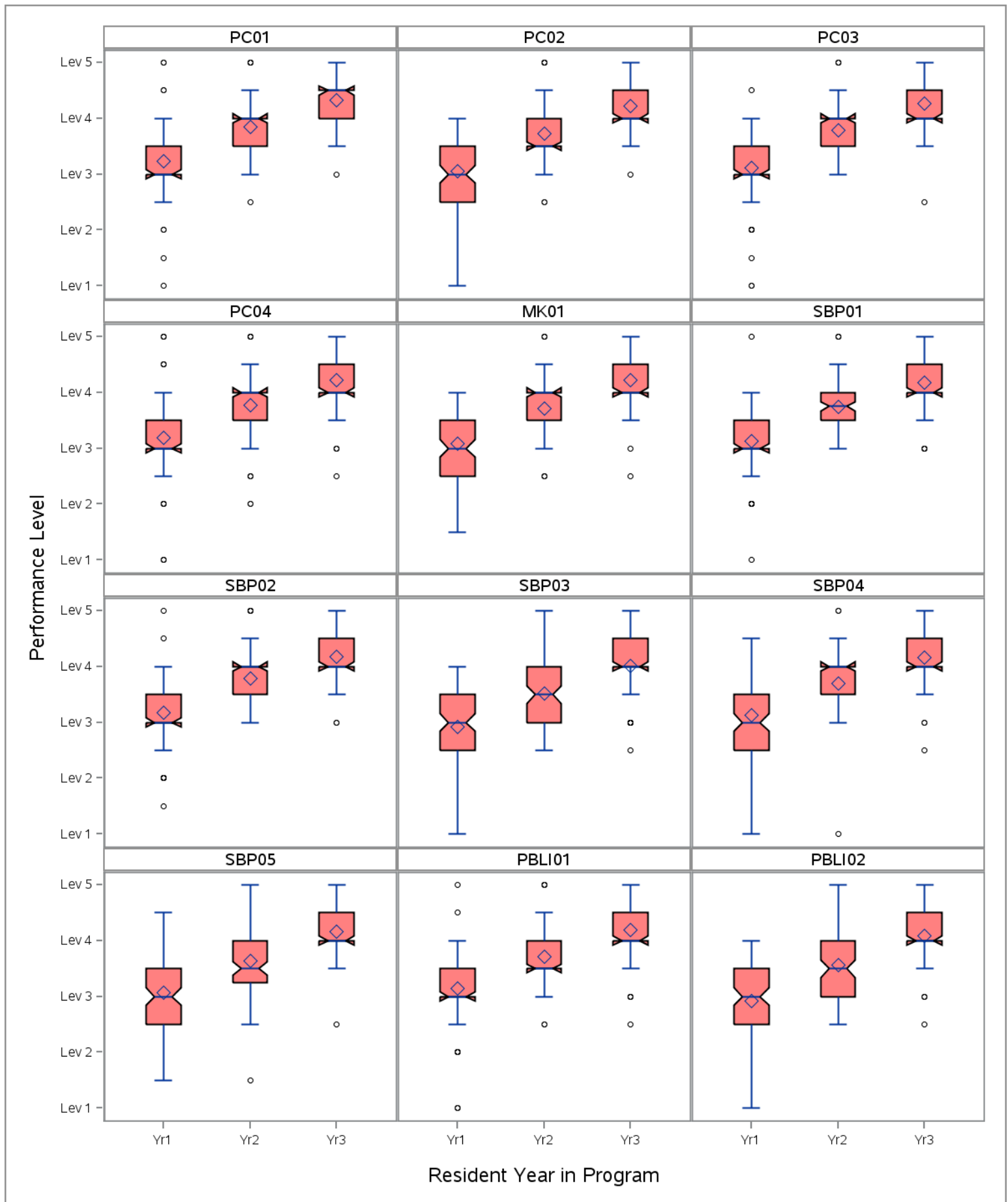


Table 93 - Pediatric gastroenterology (June 2017)



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Table 93 - Pediatric gastroenterology (June 2017)

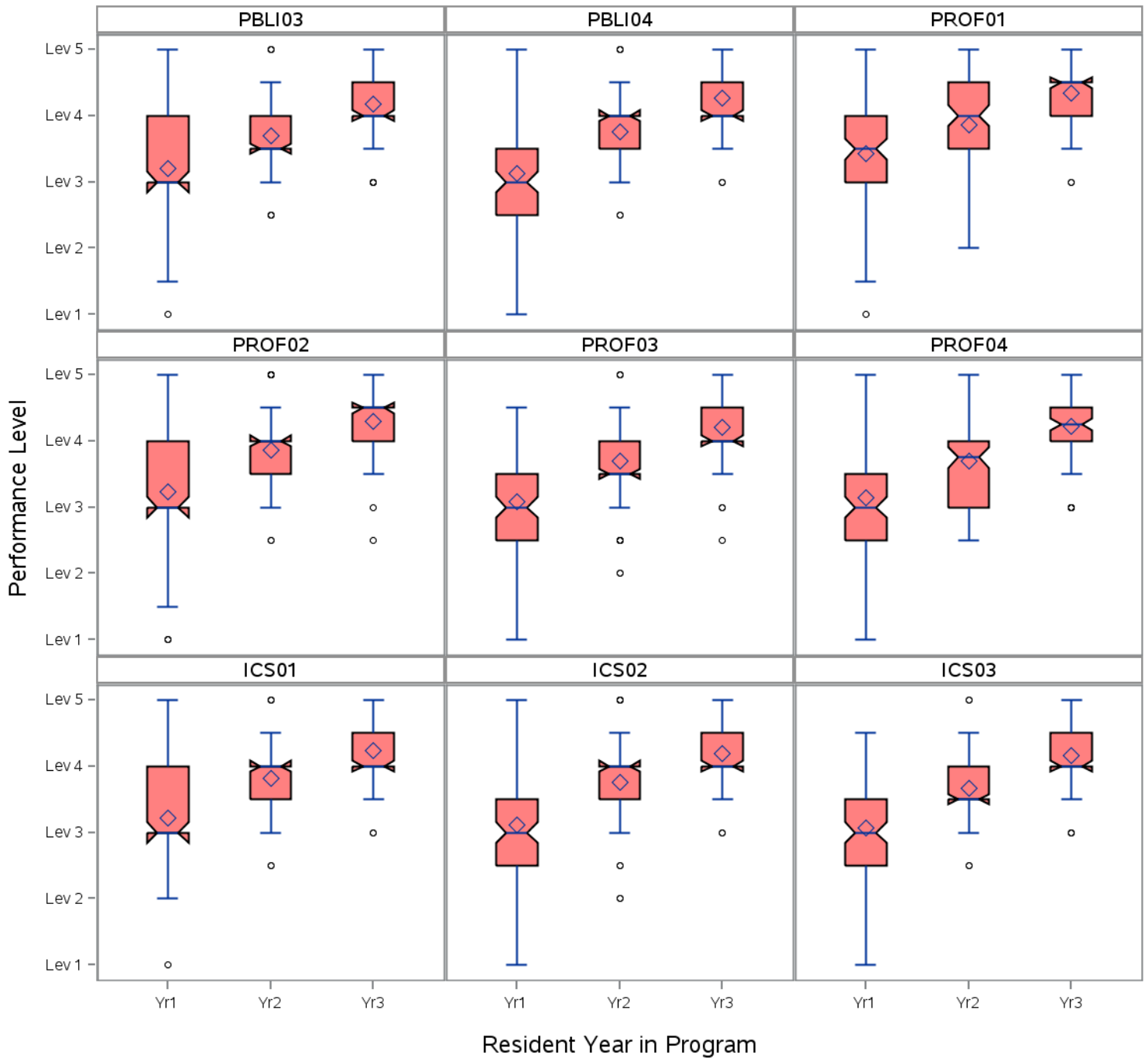
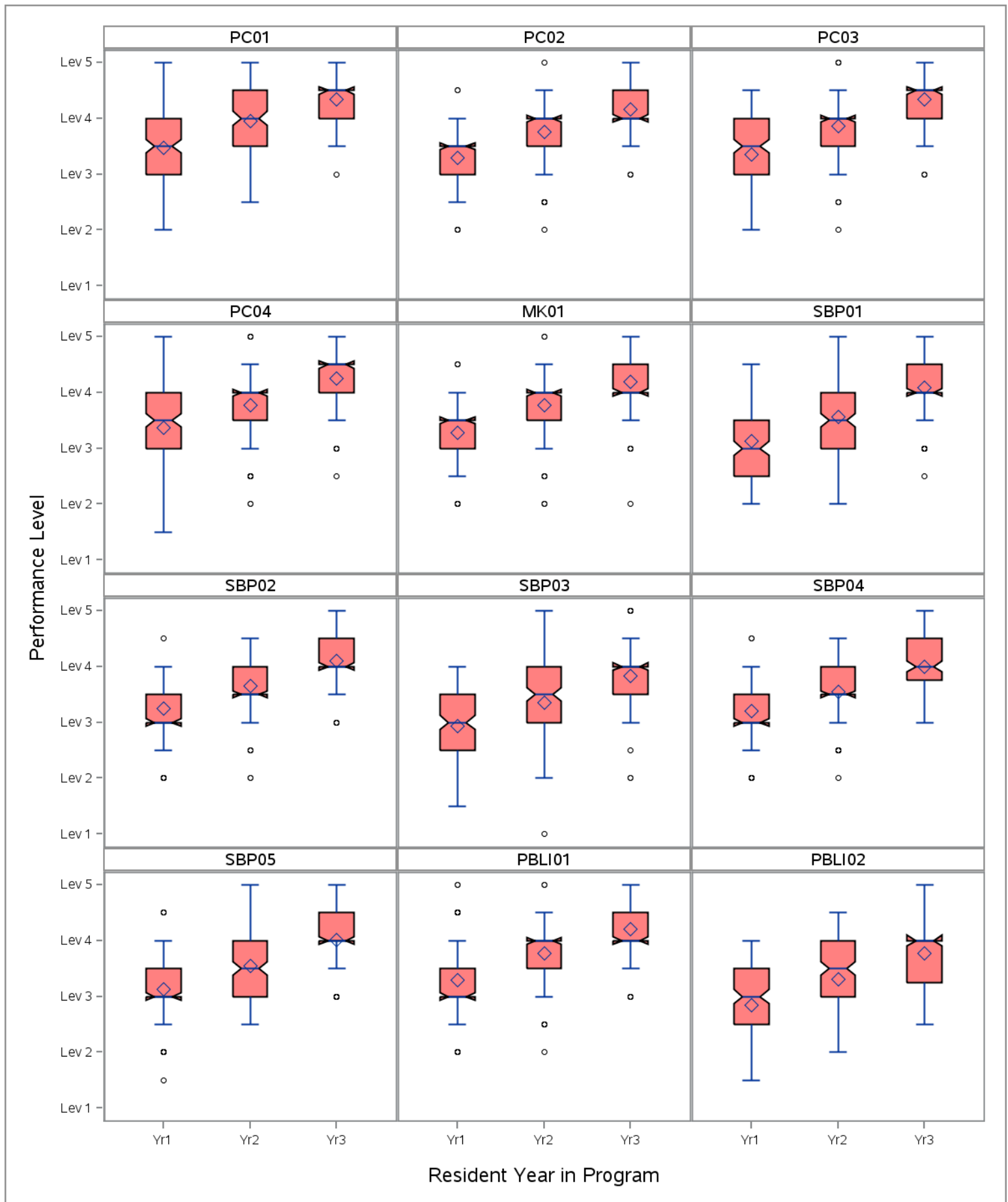


Table 94 - Pediatric hematology/oncology (June 2017)



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Table 94 - Pediatric hematology/oncology (June 2017)

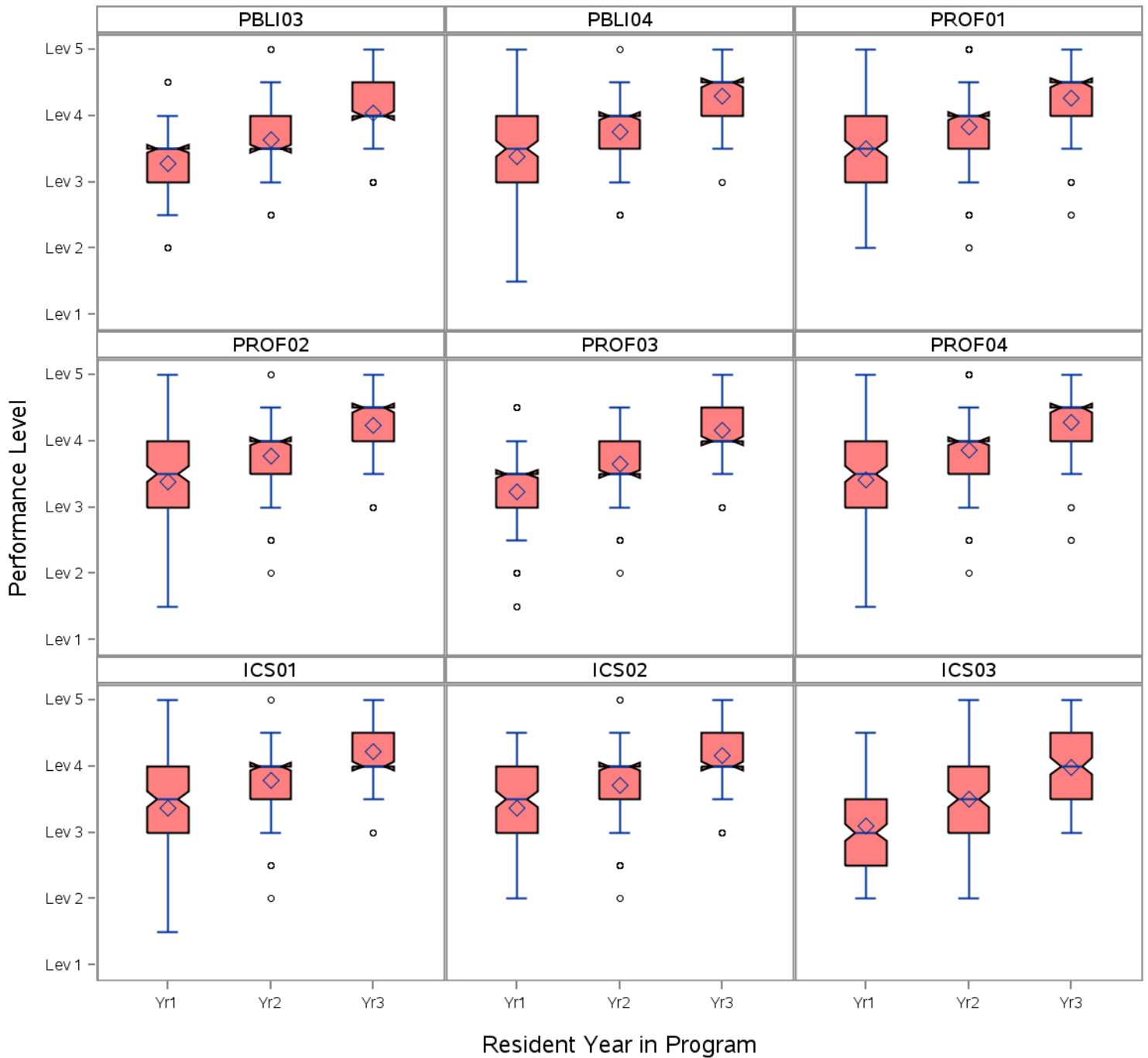
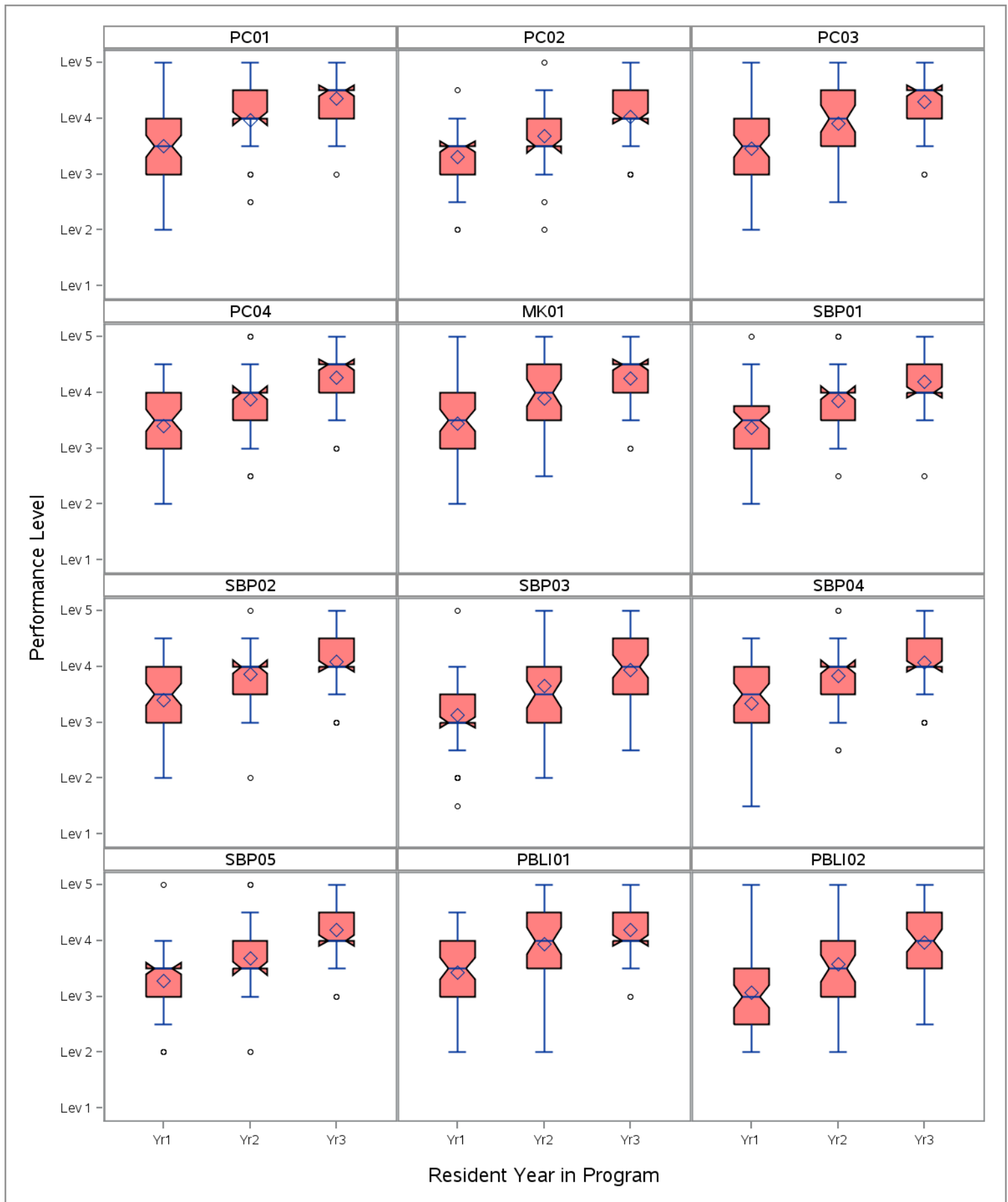


Table 95 - Pediatric infectious diseases (June 2017)



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Table 95 - Pediatric infectious diseases (June 2017)

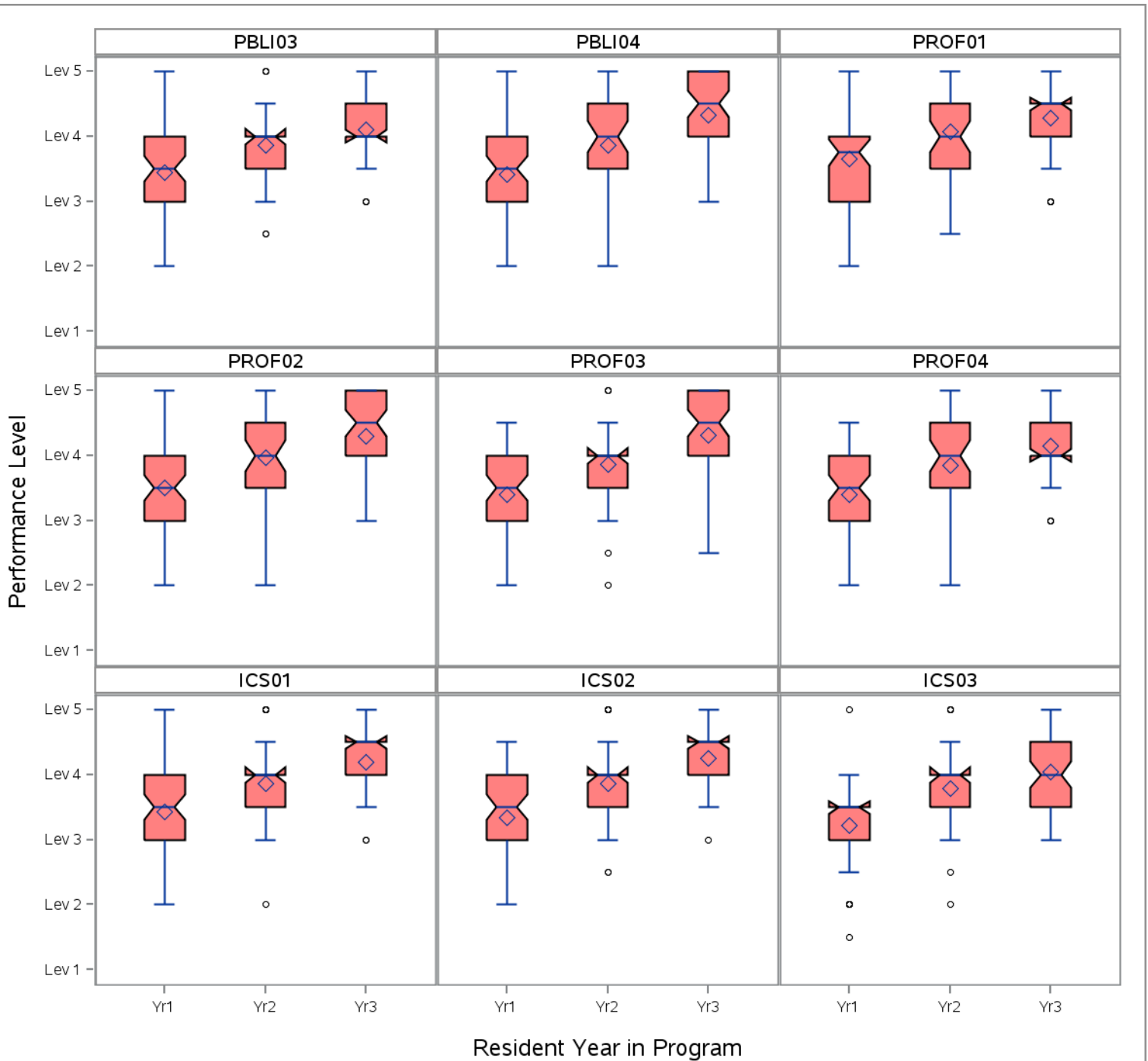
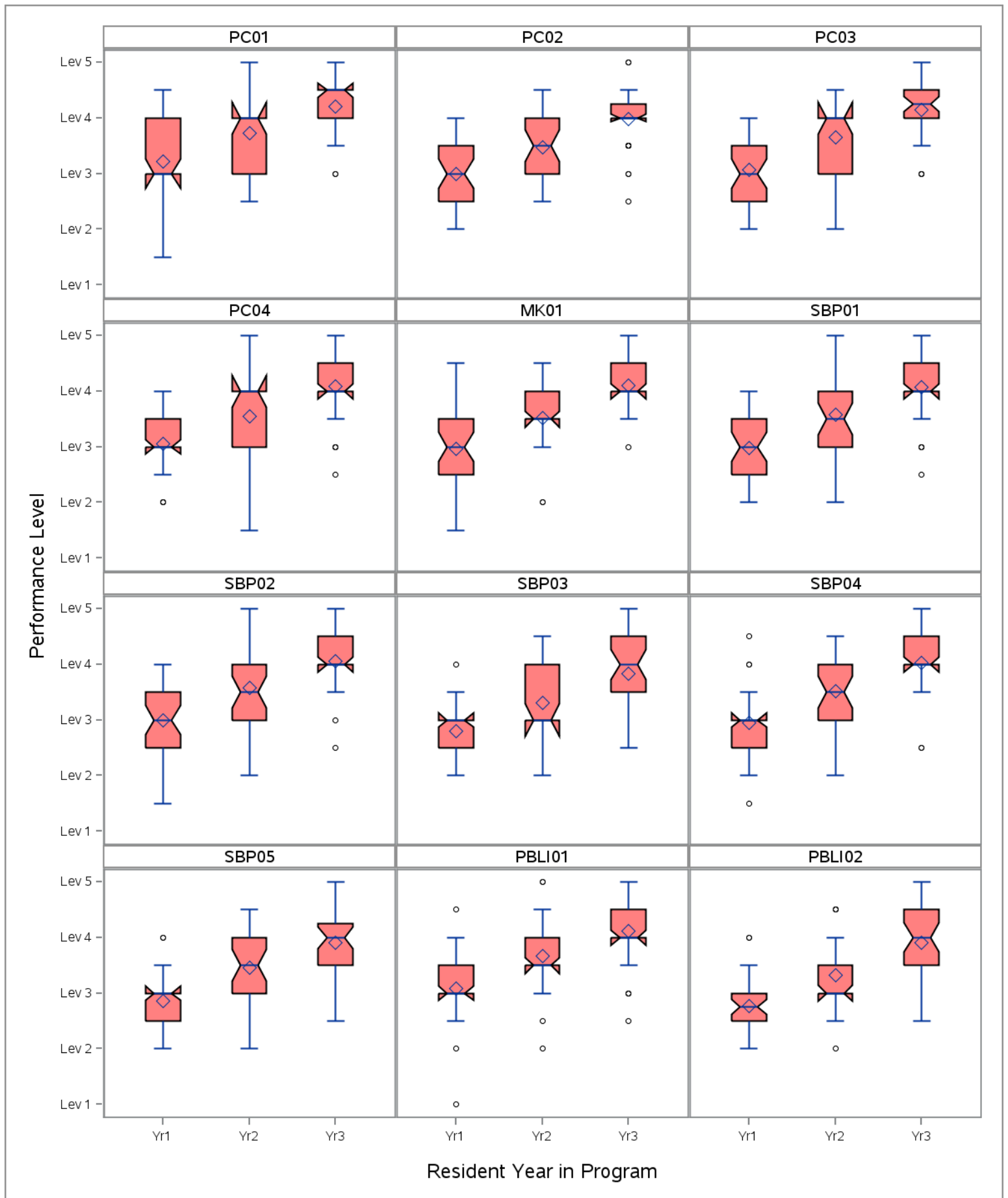


Table 96 - Pediatric nephrology (June 2017)



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Table 96 - Pediatric nephrology (June 2017)

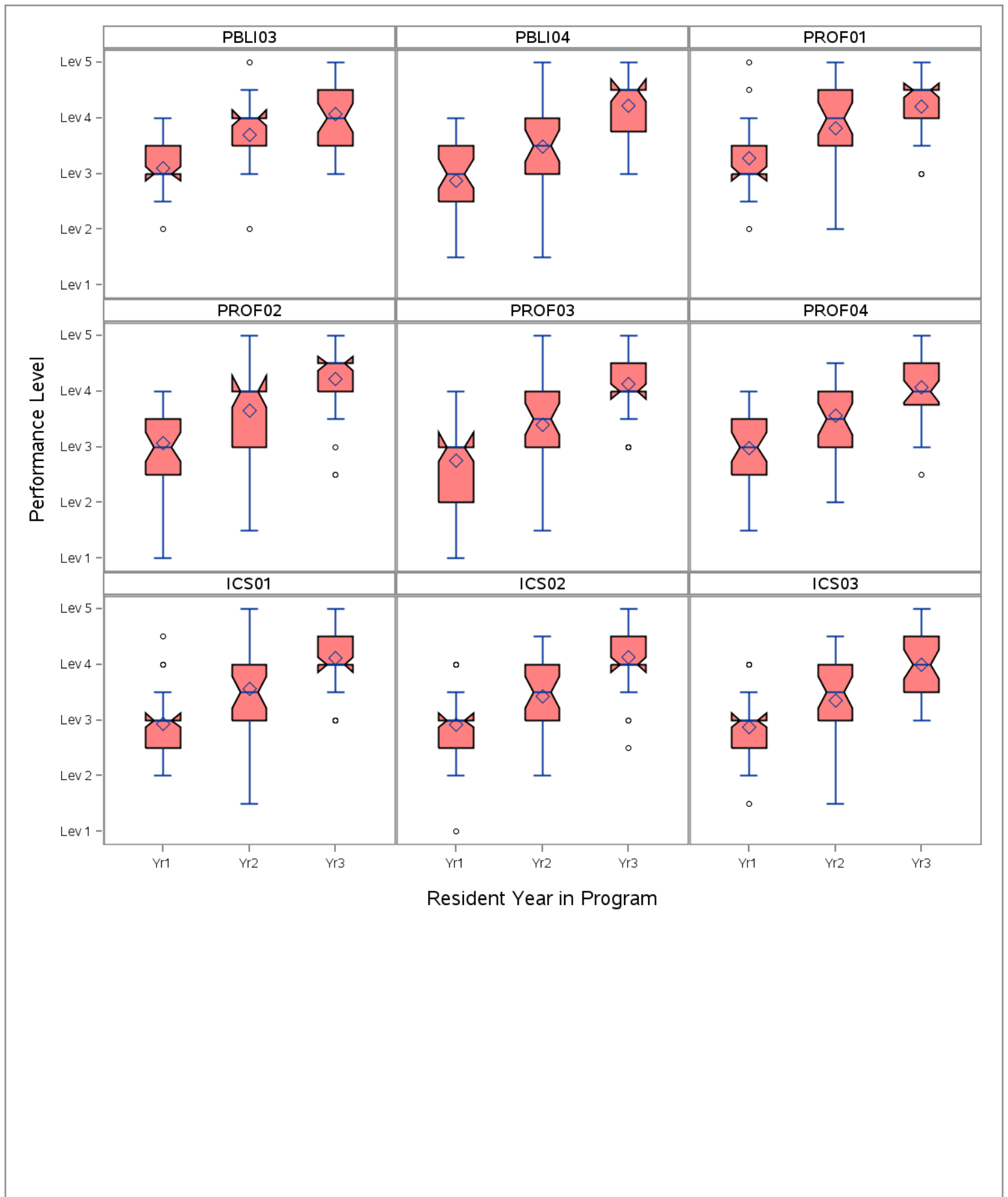
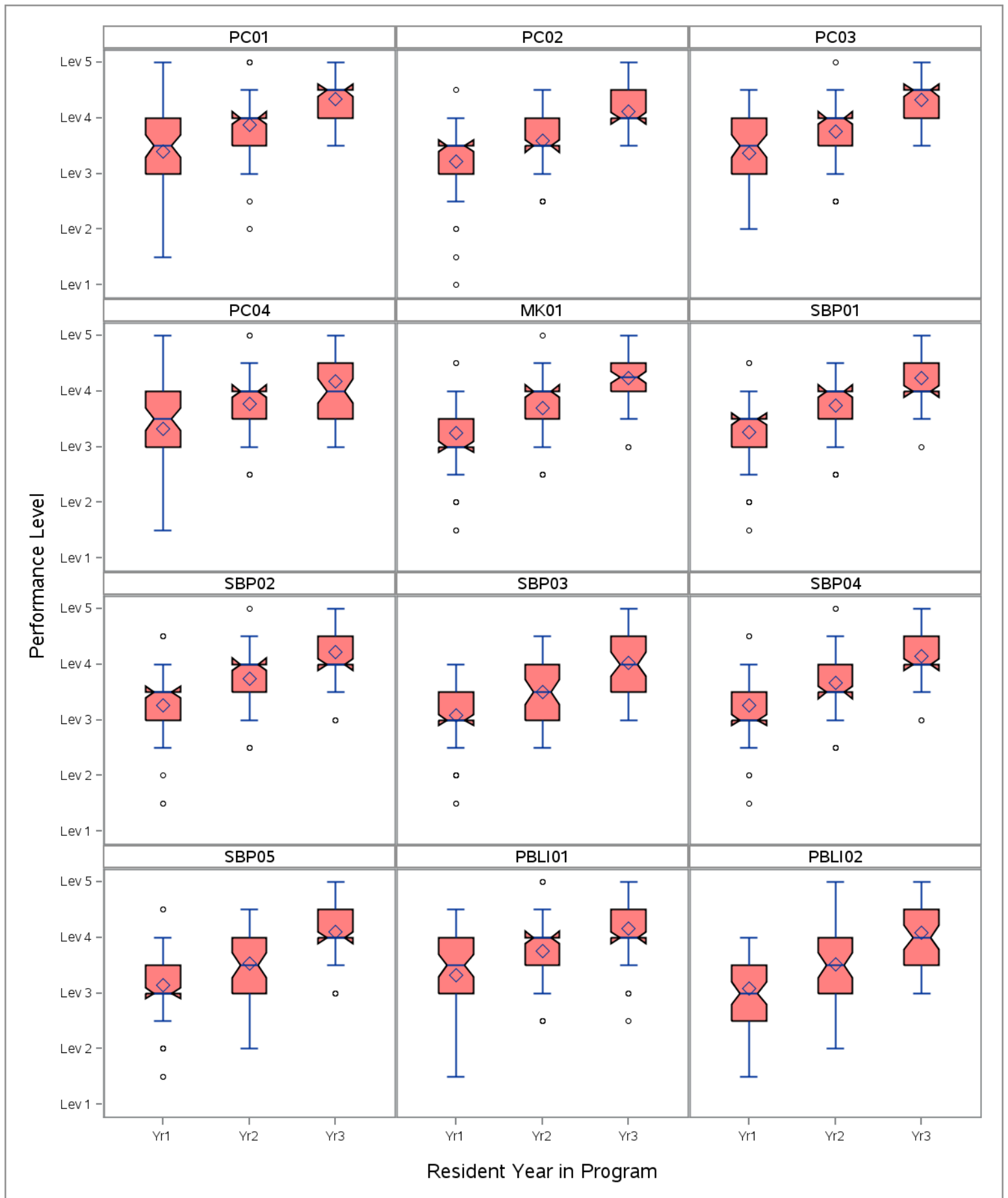


Table 97 - Pediatric pulmonology (June 2017)



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Table 97 - Pediatric pulmonology (June 2017)

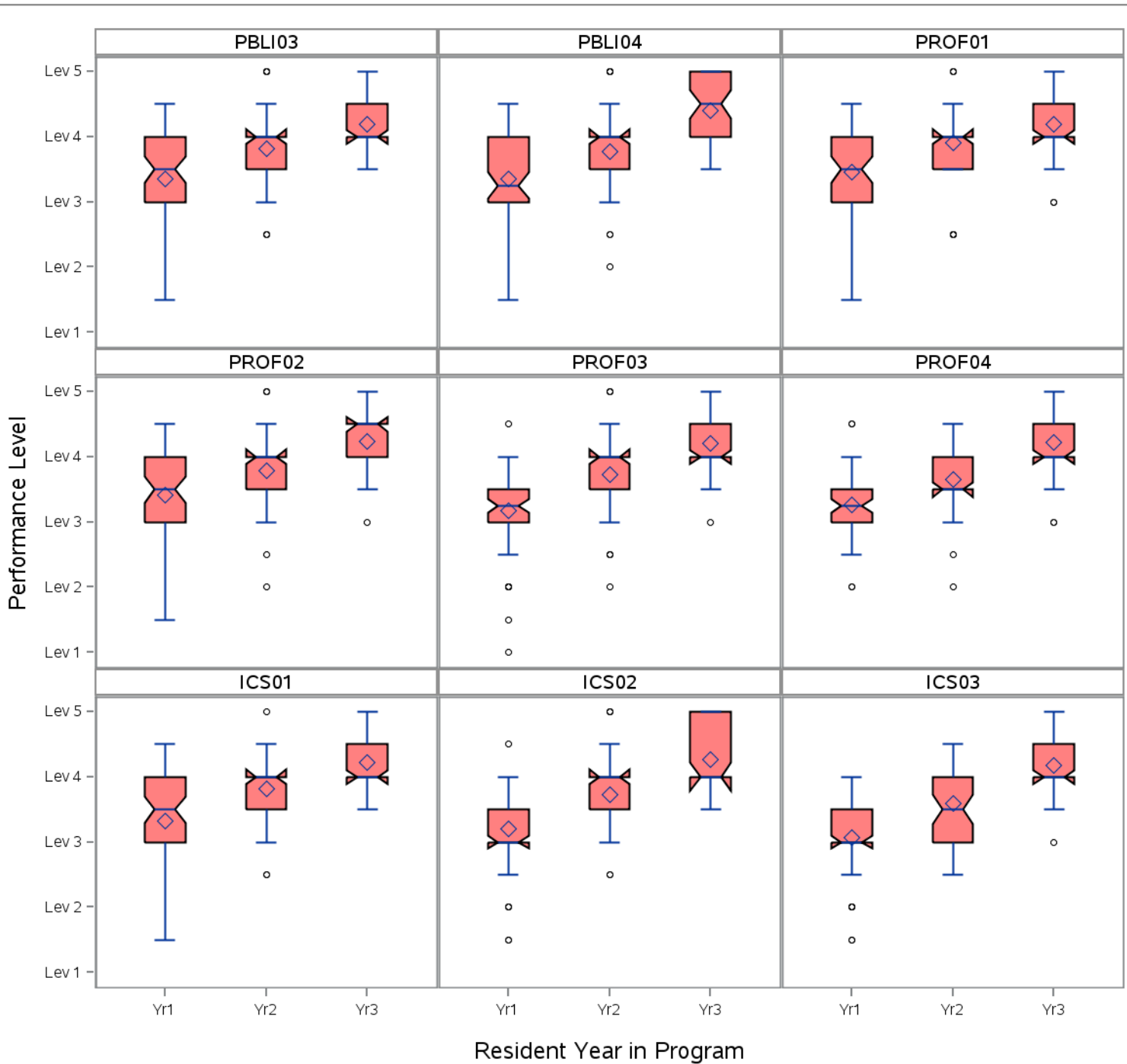
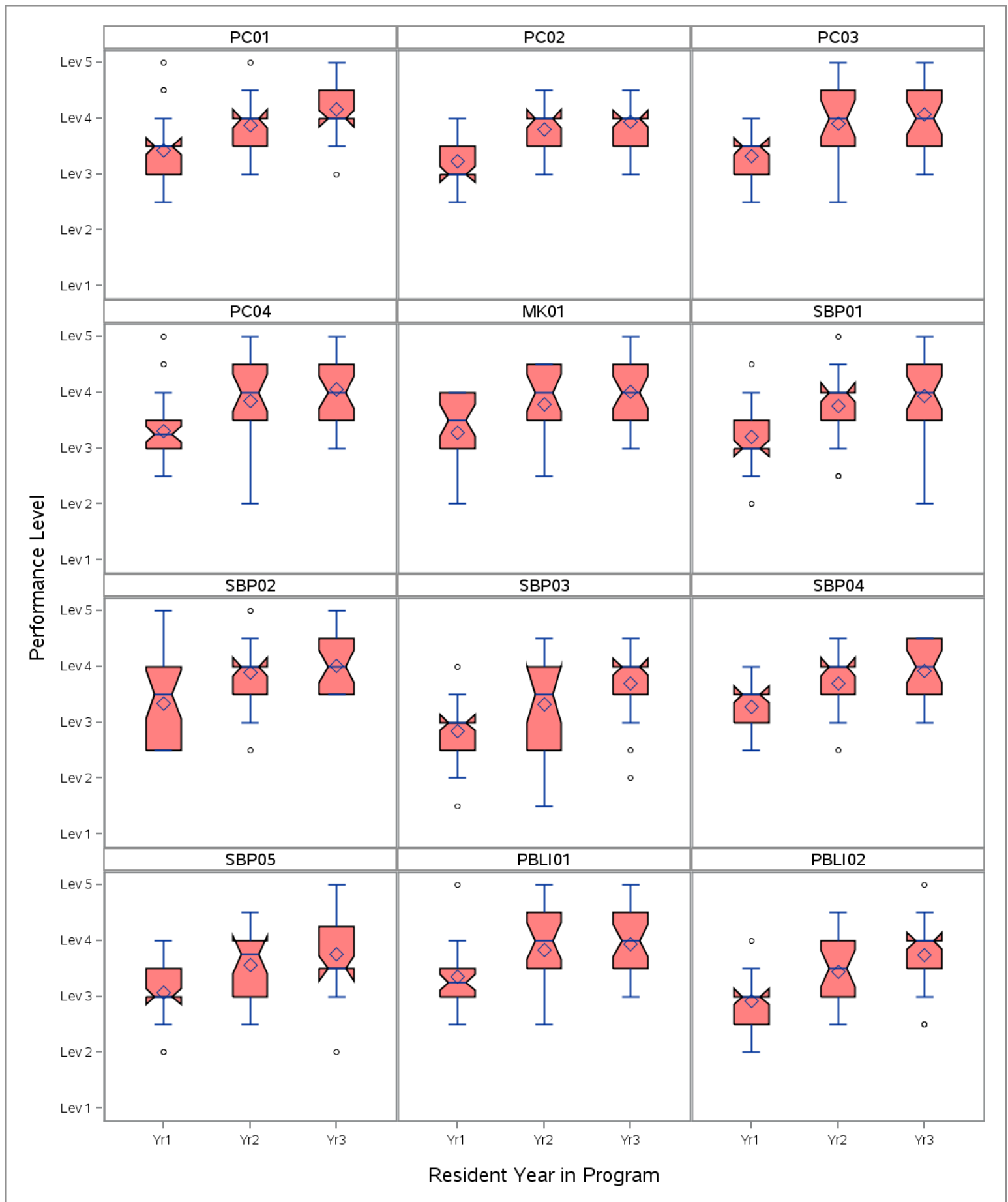


Table 98 - Pediatric rheumatology (June 2017)



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Table 98 - Pediatric rheumatology (June 2017)

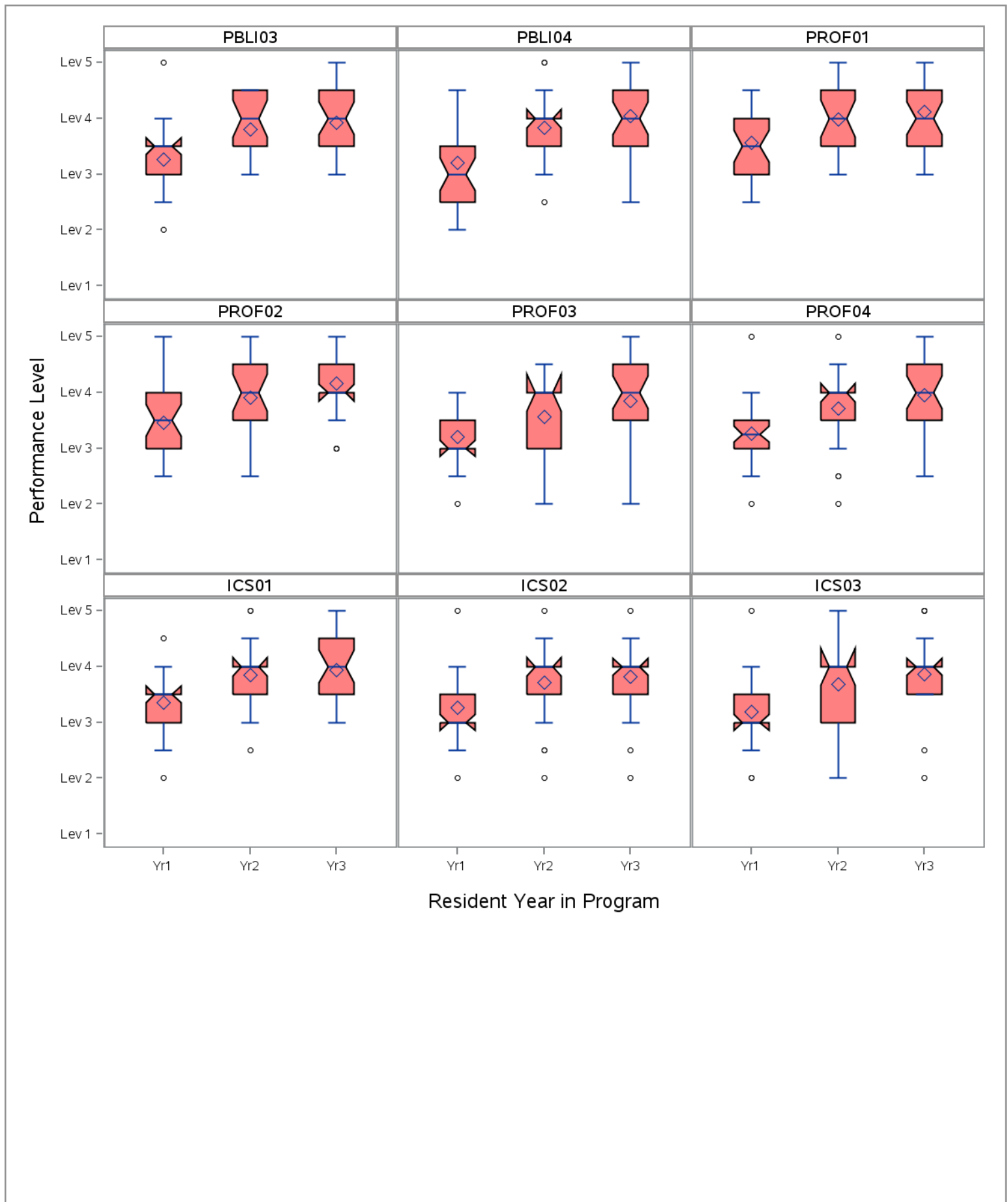
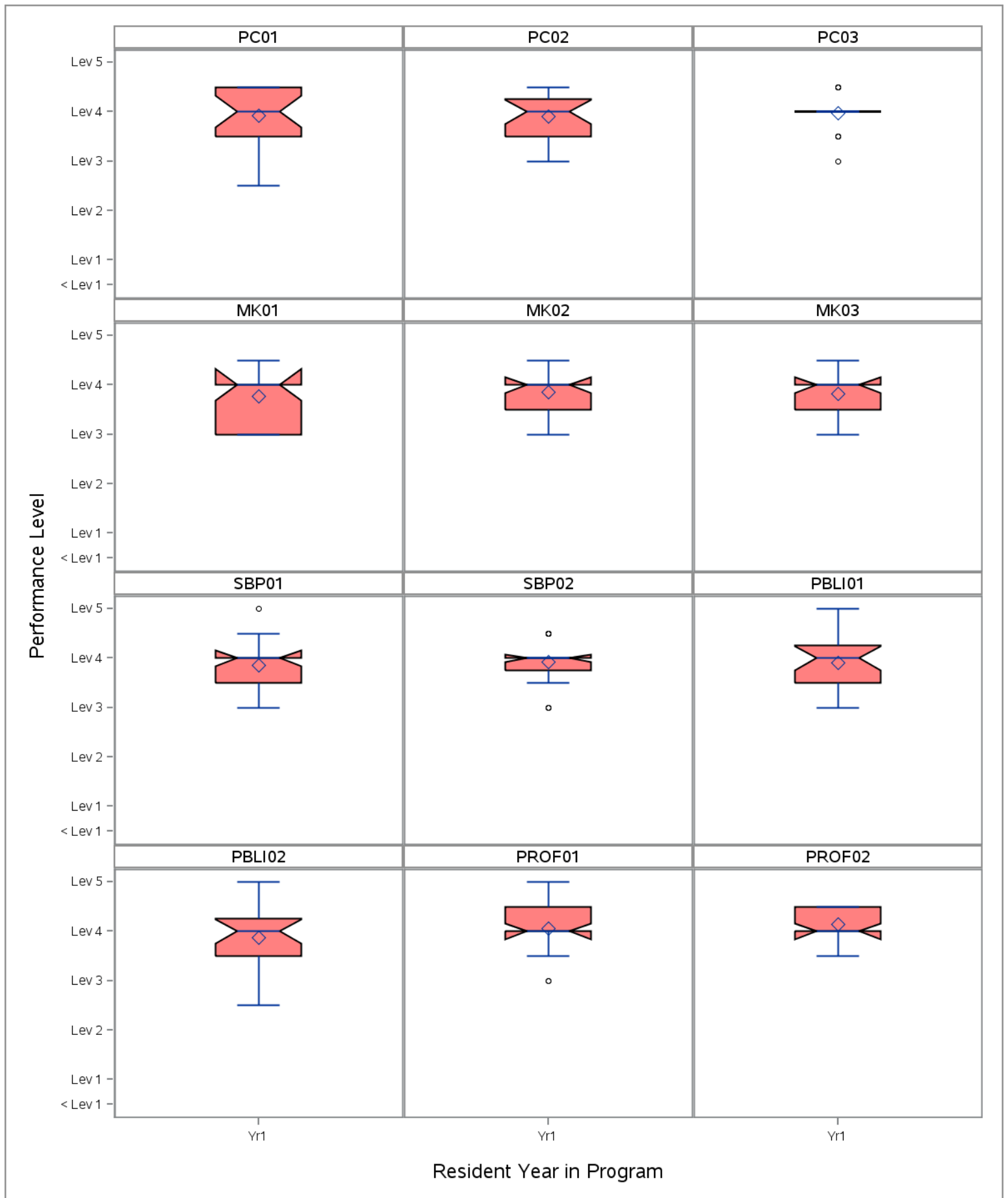


Table 99 - Pediatric sports medicine (June 2017)



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Table 99 - Pediatric sports medicine (June 2017)

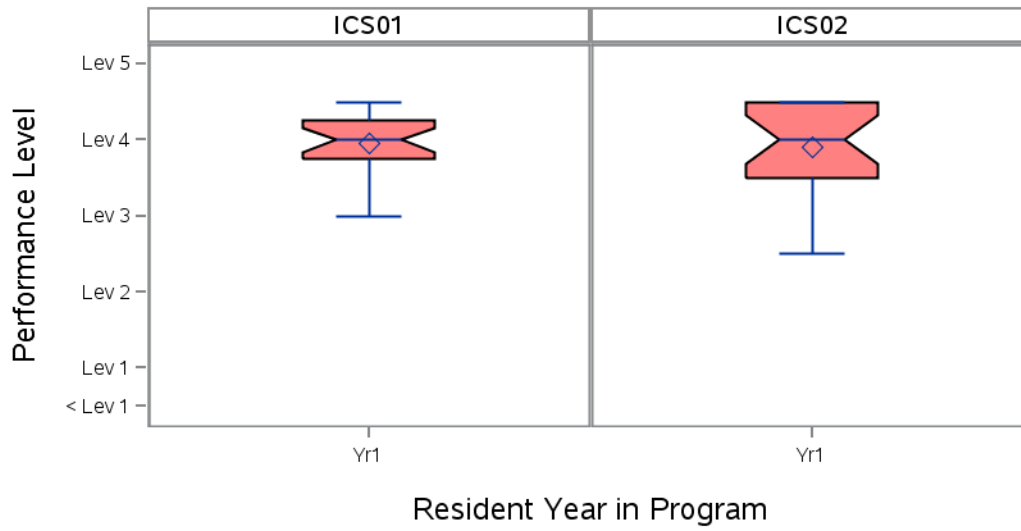
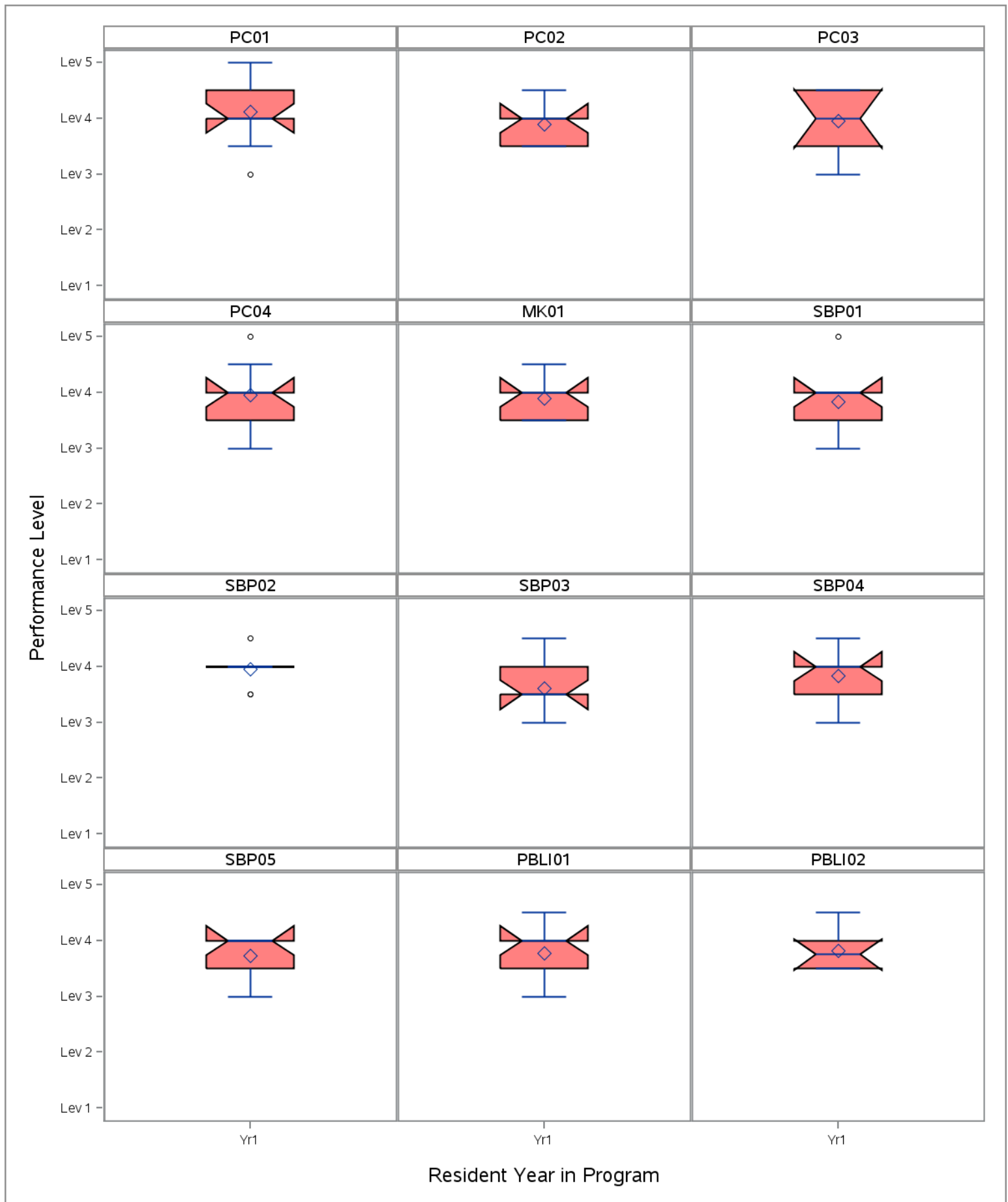


Table 100 - Pediatric transplant hepatology (June 2017)



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Table 100 - Pediatric transplant hepatology (June 2017)

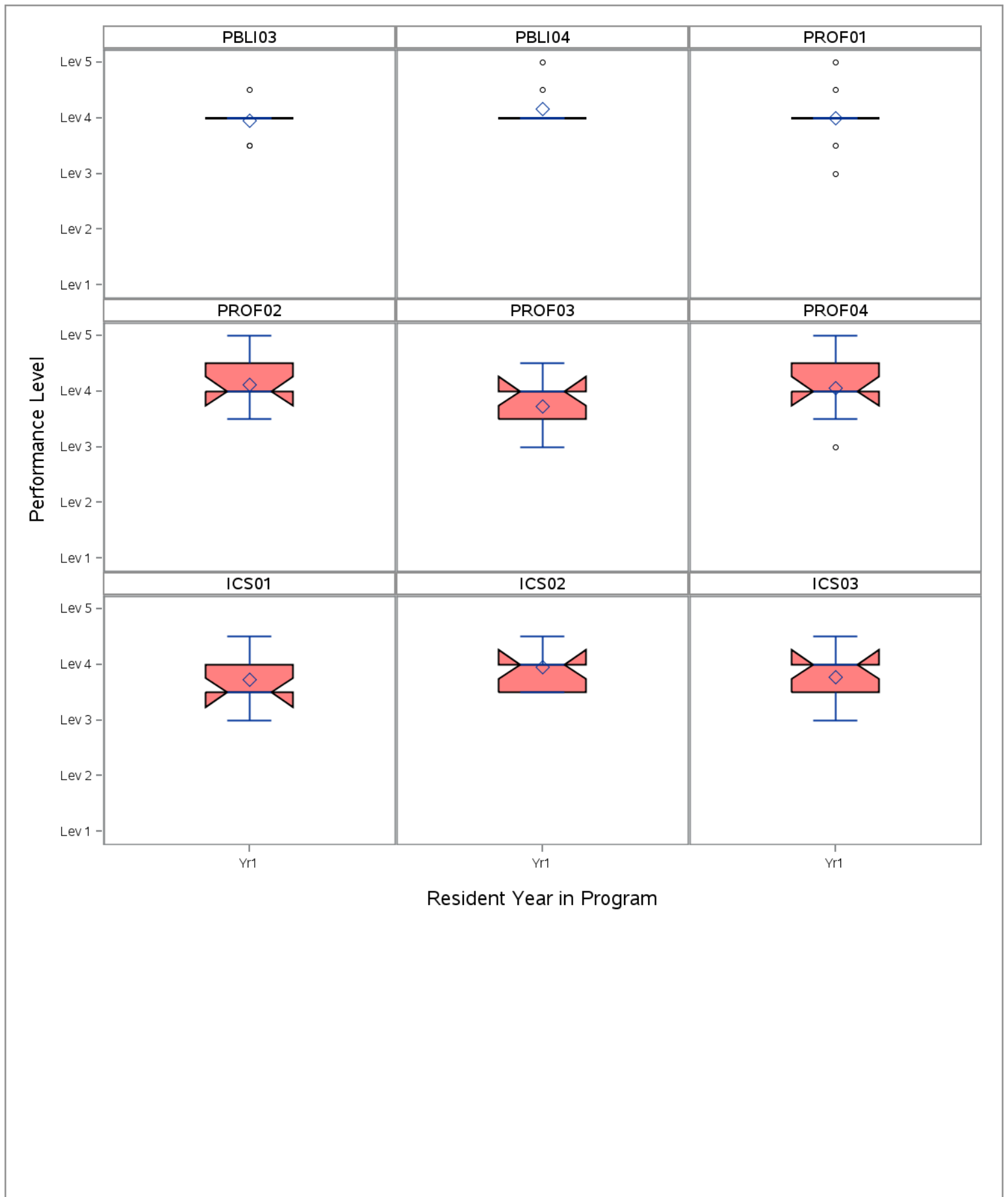
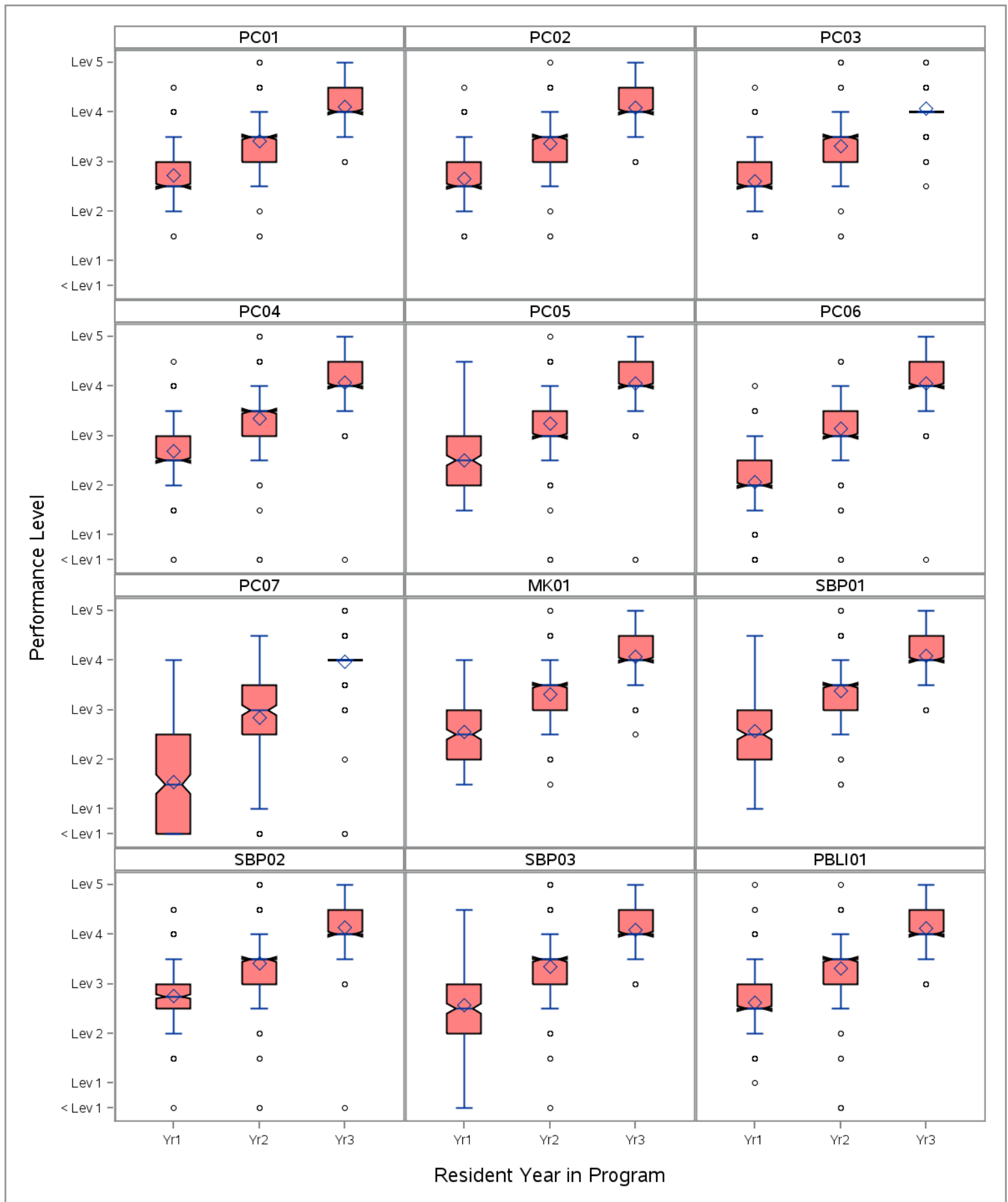


Table 101 - Physical medicine and rehabilitation (June 2017)



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Table 101 - Physical medicine and rehabilitation (June 2017)

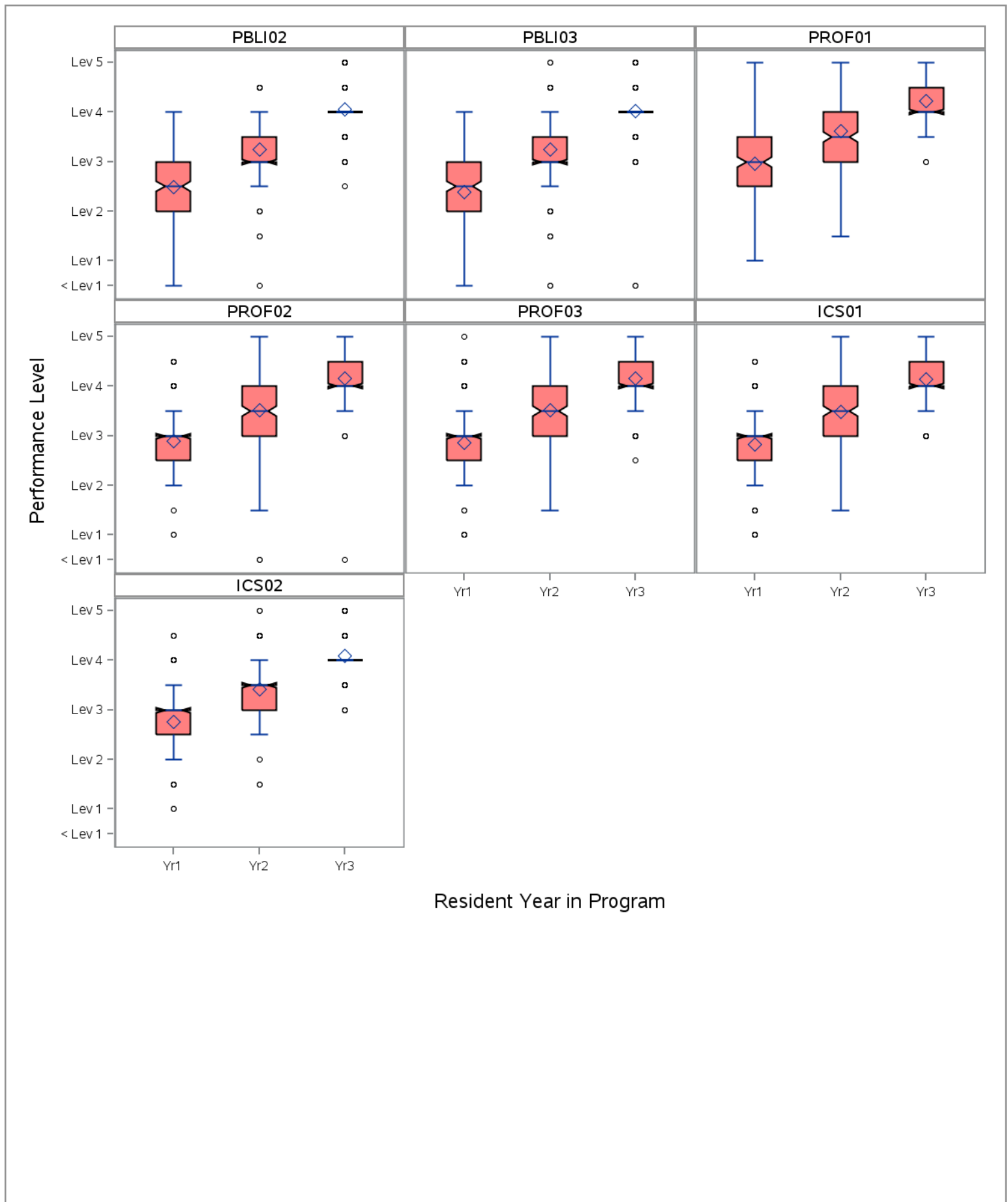
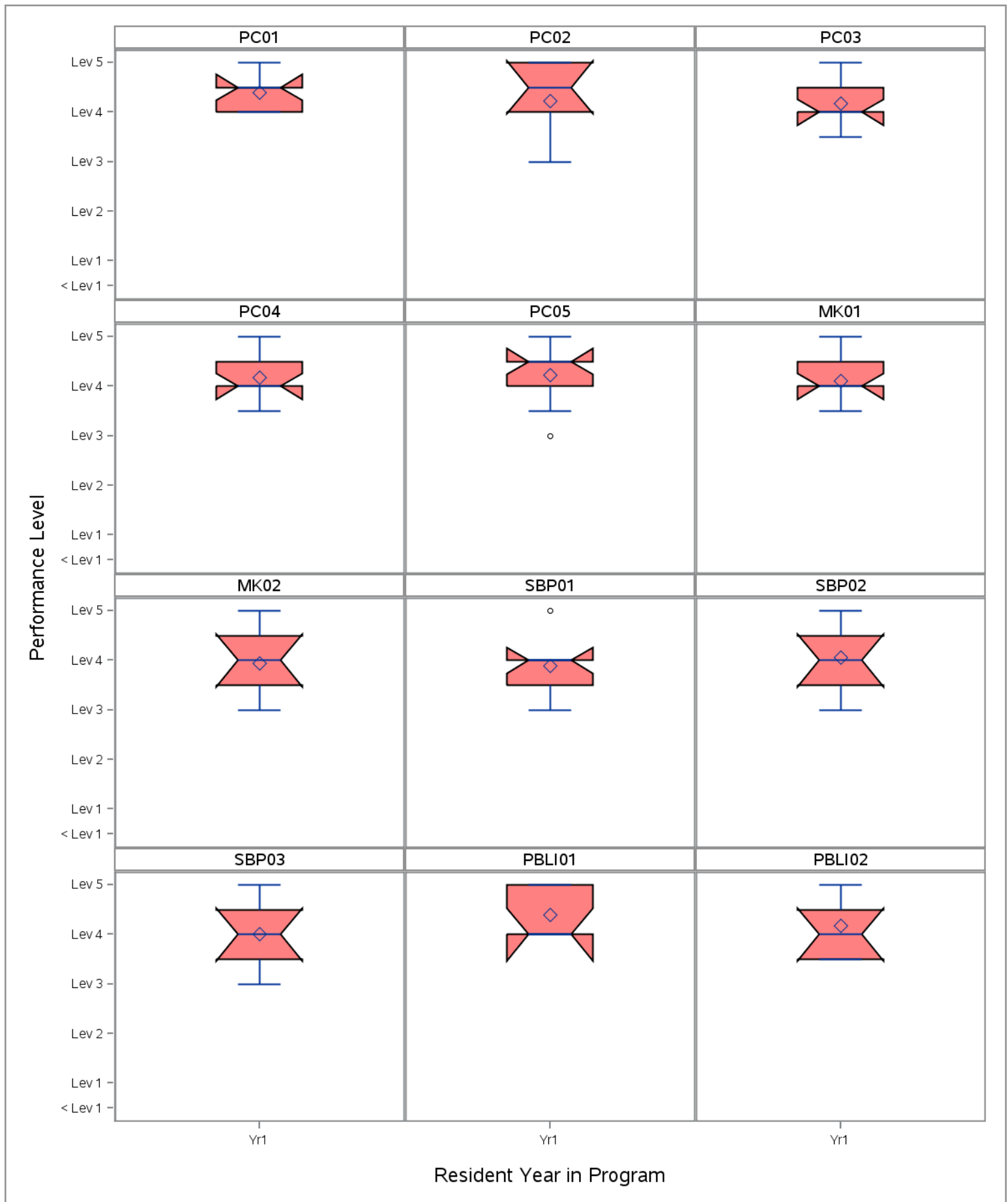


Table 102 - Brain injury medicine (June 2017)



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Table 102 - Brain injury medicine (June 2017)

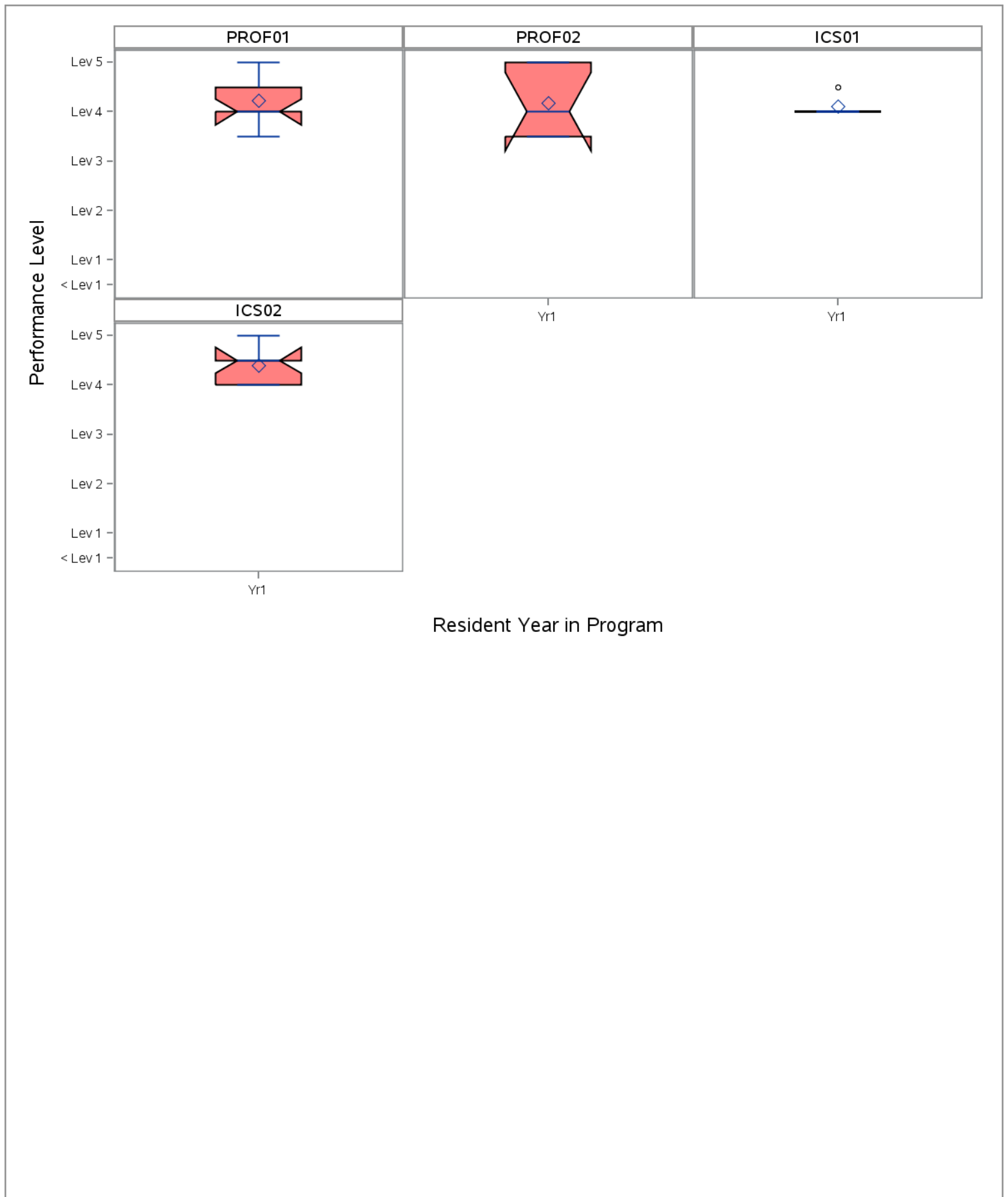
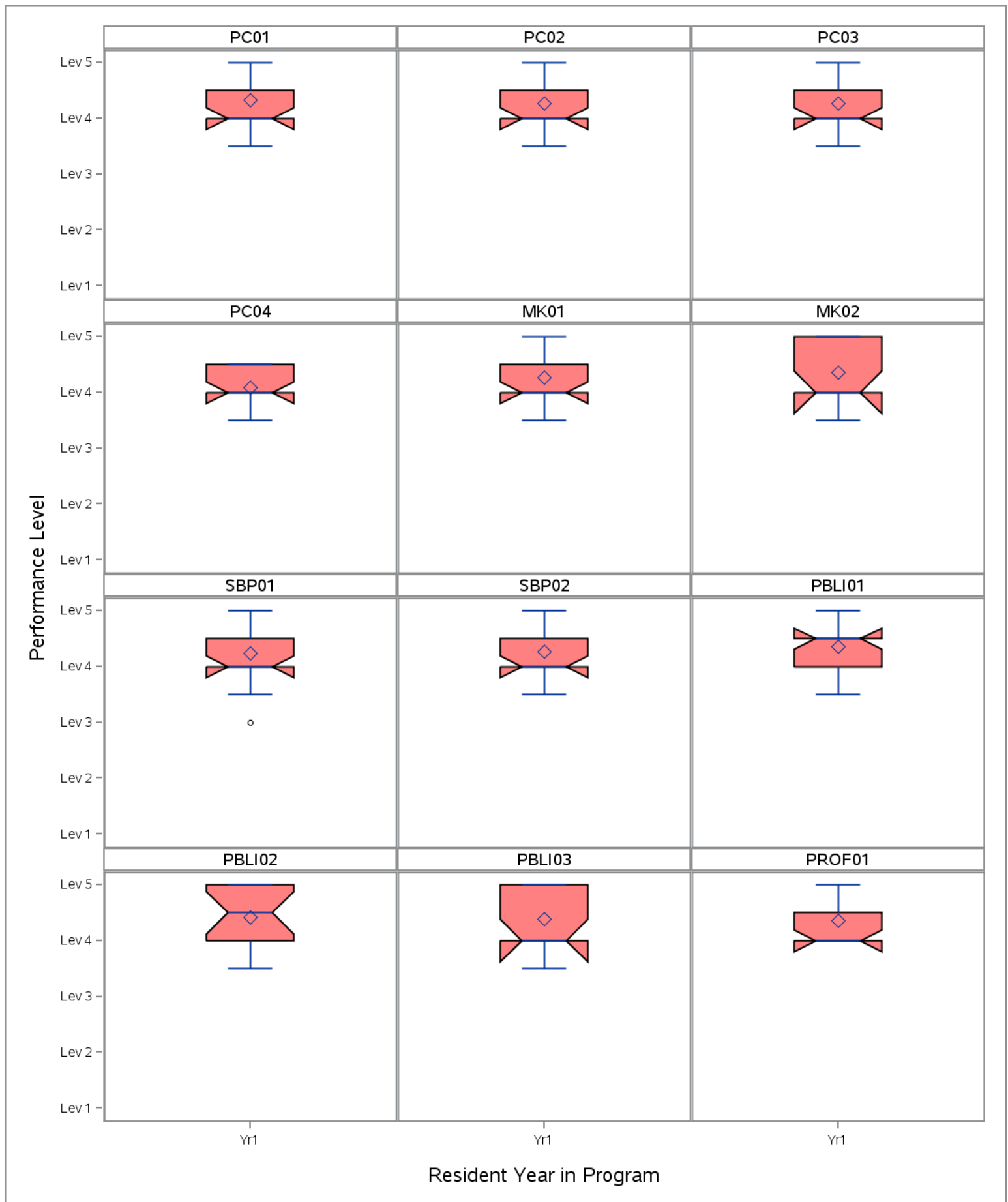


Table 103 - Spinal cord injury medicine (June 2017)



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Table 103 - Spinal cord injury medicine (June 2017)

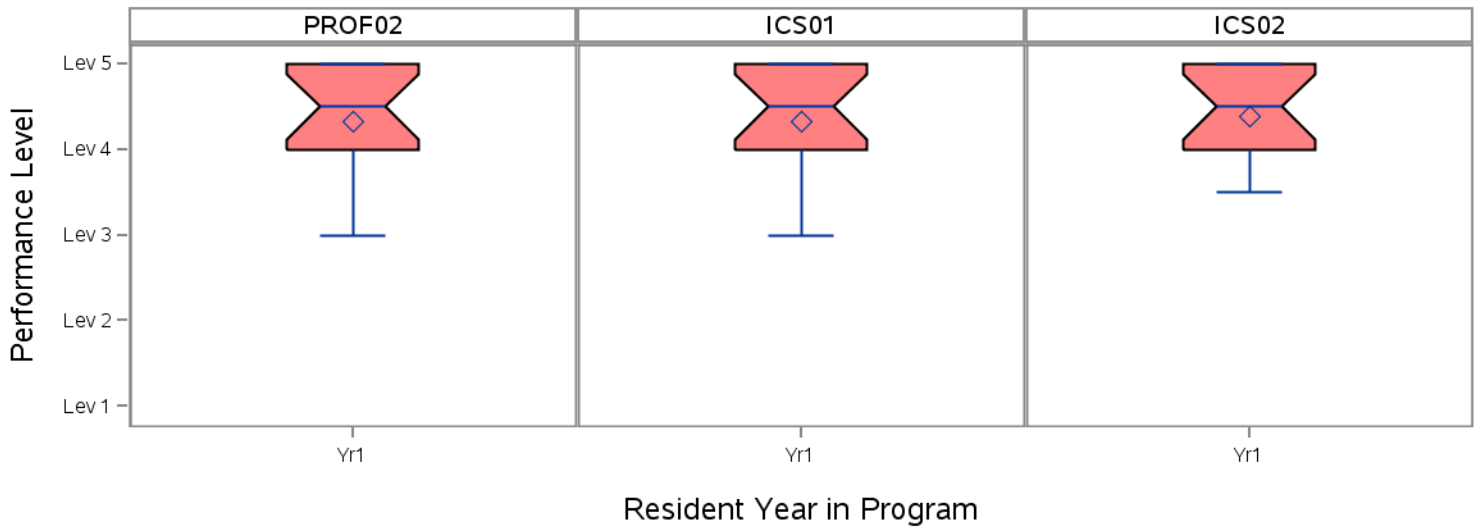
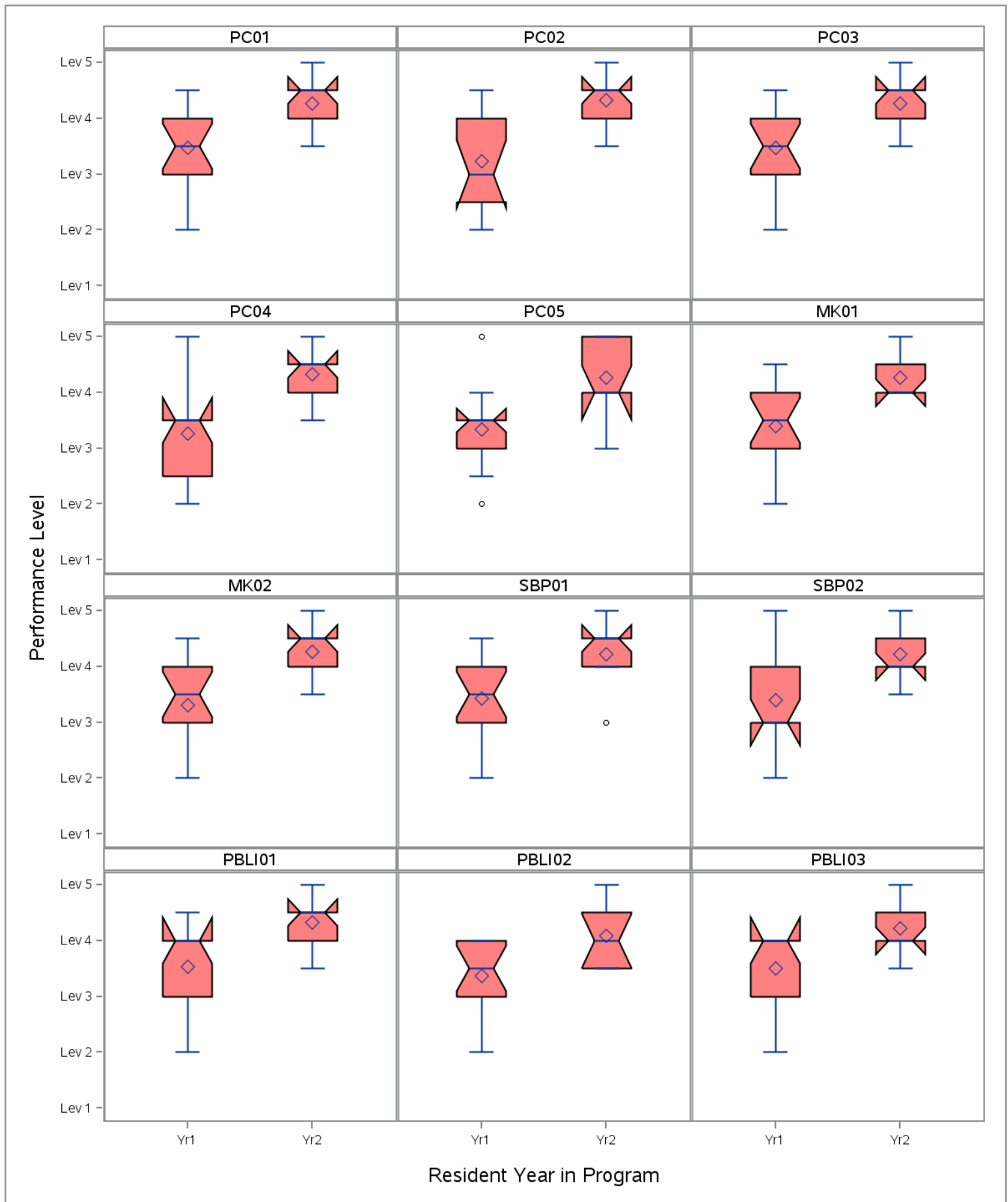


Table 104 - Pediatric rehabilitation (June 2017)



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Table 104 - Pediatric rehabilitation (June 2017)

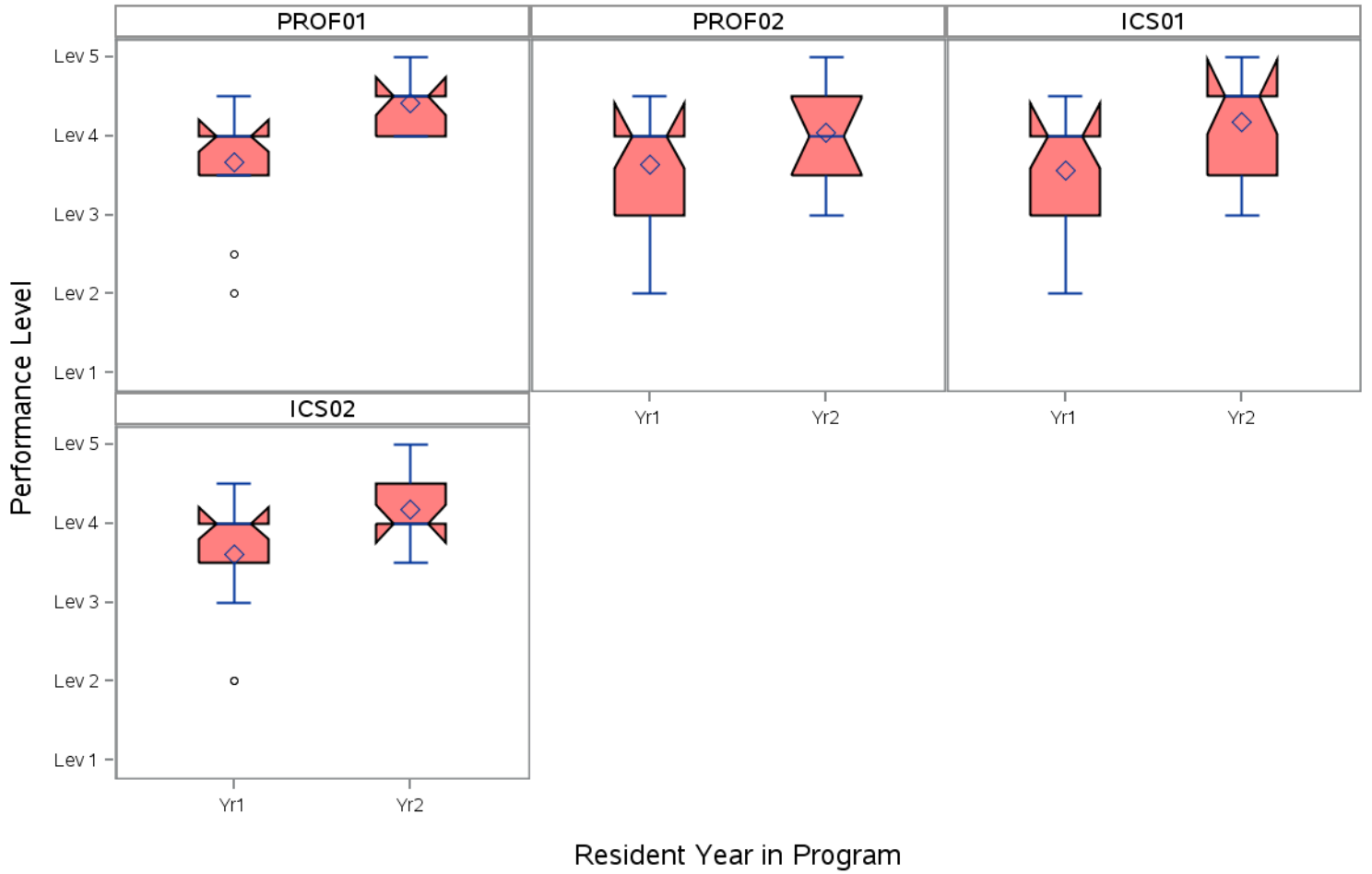
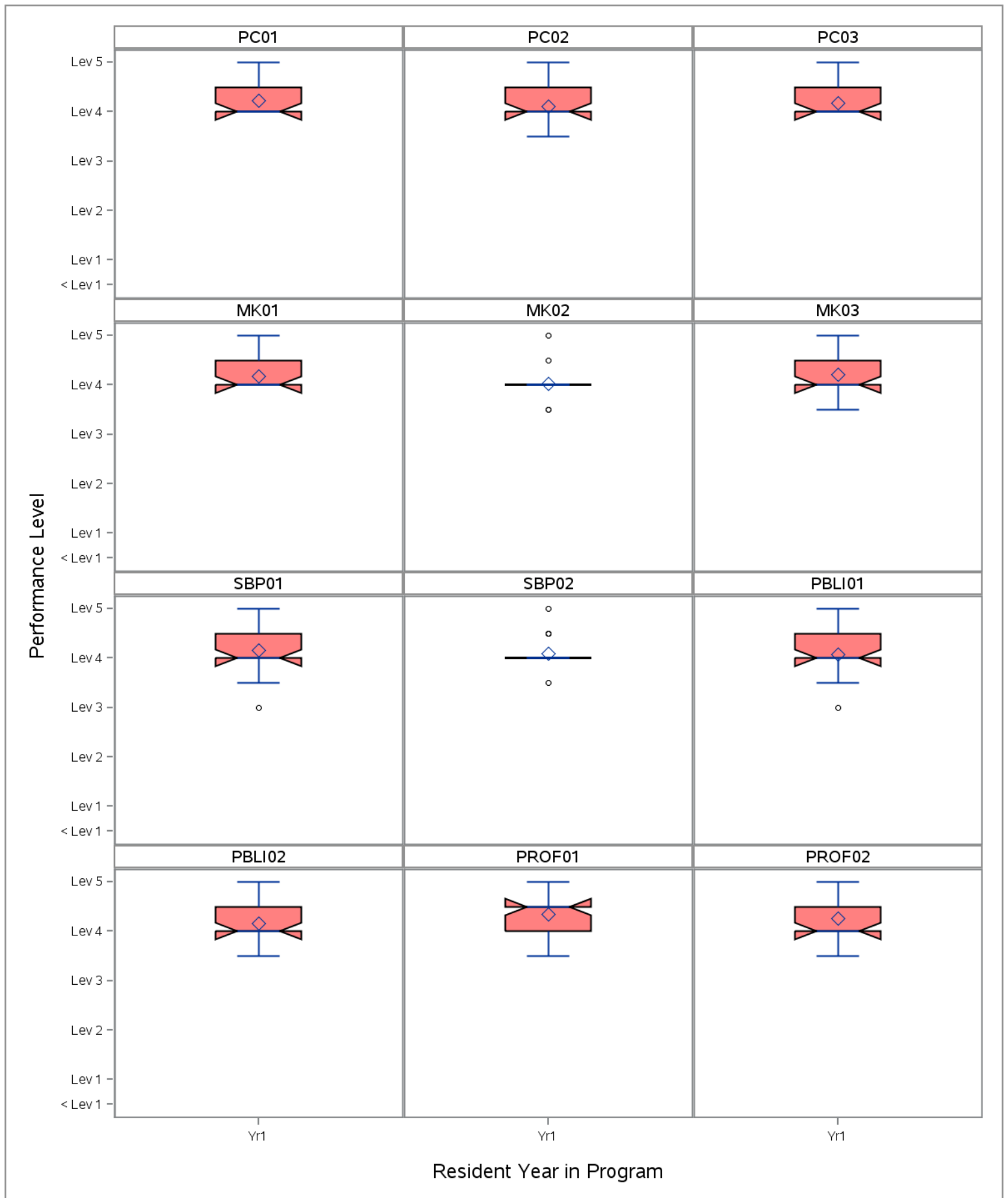


Table 105 - Sports medicine (June 2017)



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Table 105 - Sports medicine (June 2017)

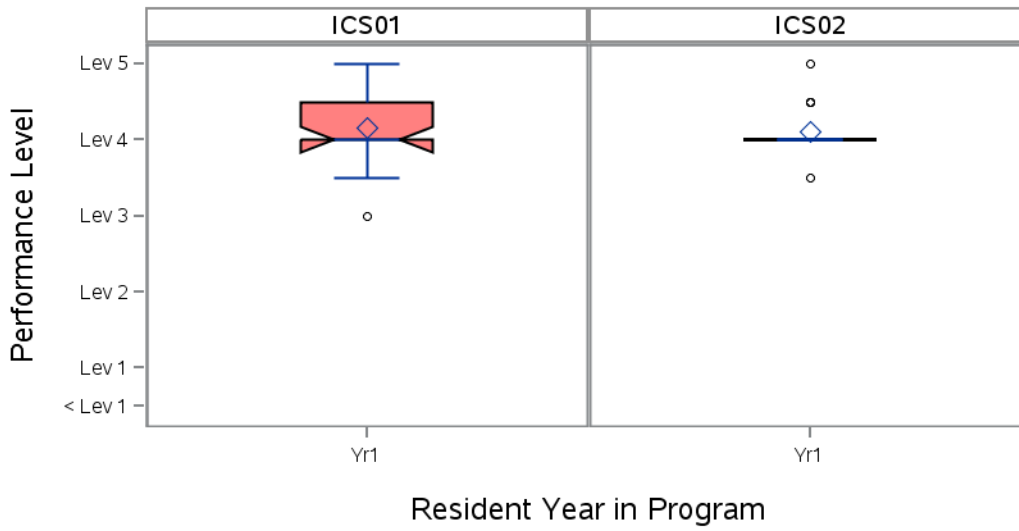
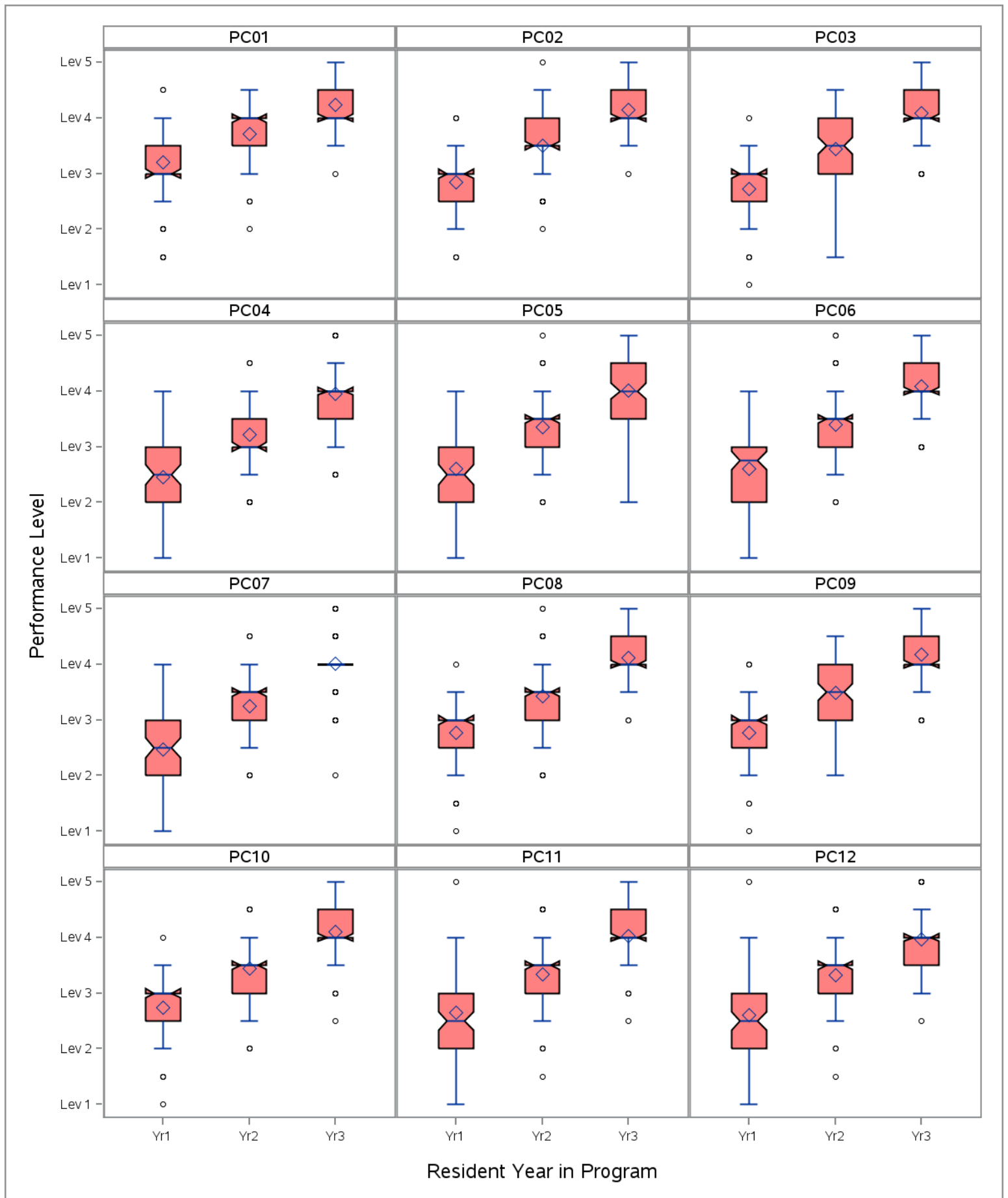
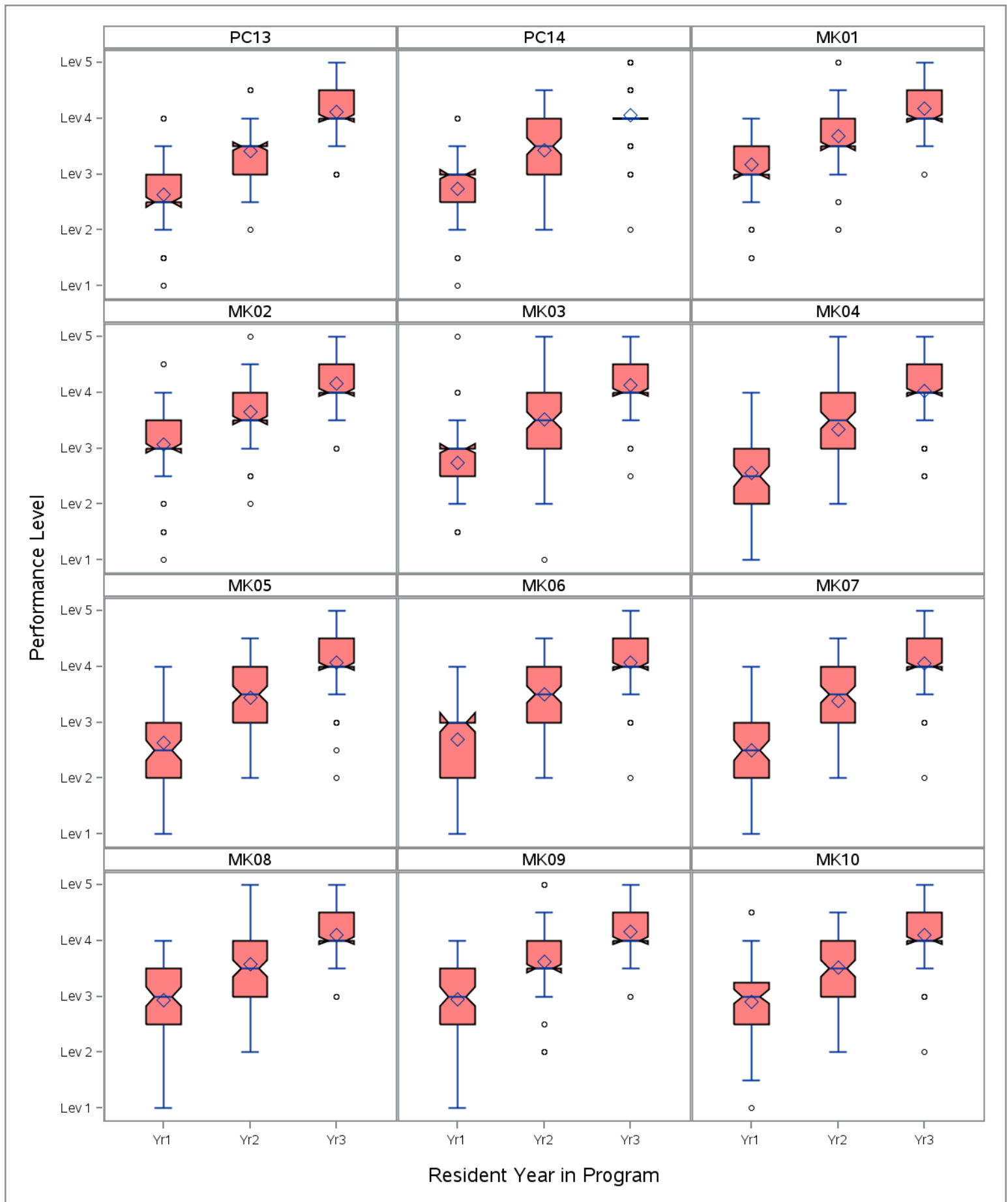


Table 106 - Plastic surgery (June 2017)



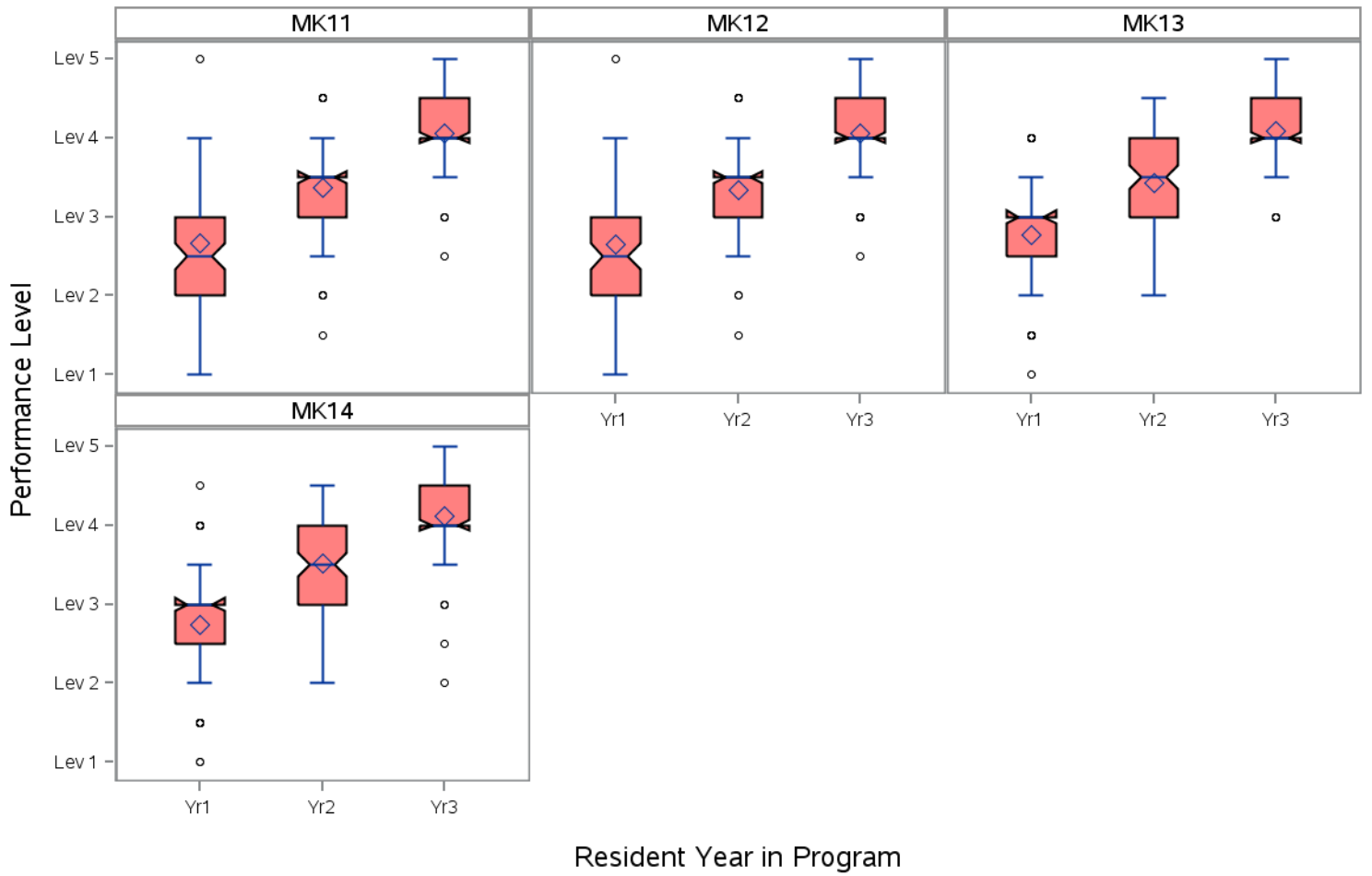
Continue to next page for Plastic surgery

Table 106 - Plastic surgery (June 2017)



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Table 106 - Plastic surgery (June 2017)



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Table 106 - Plastic surgery (June 2017)

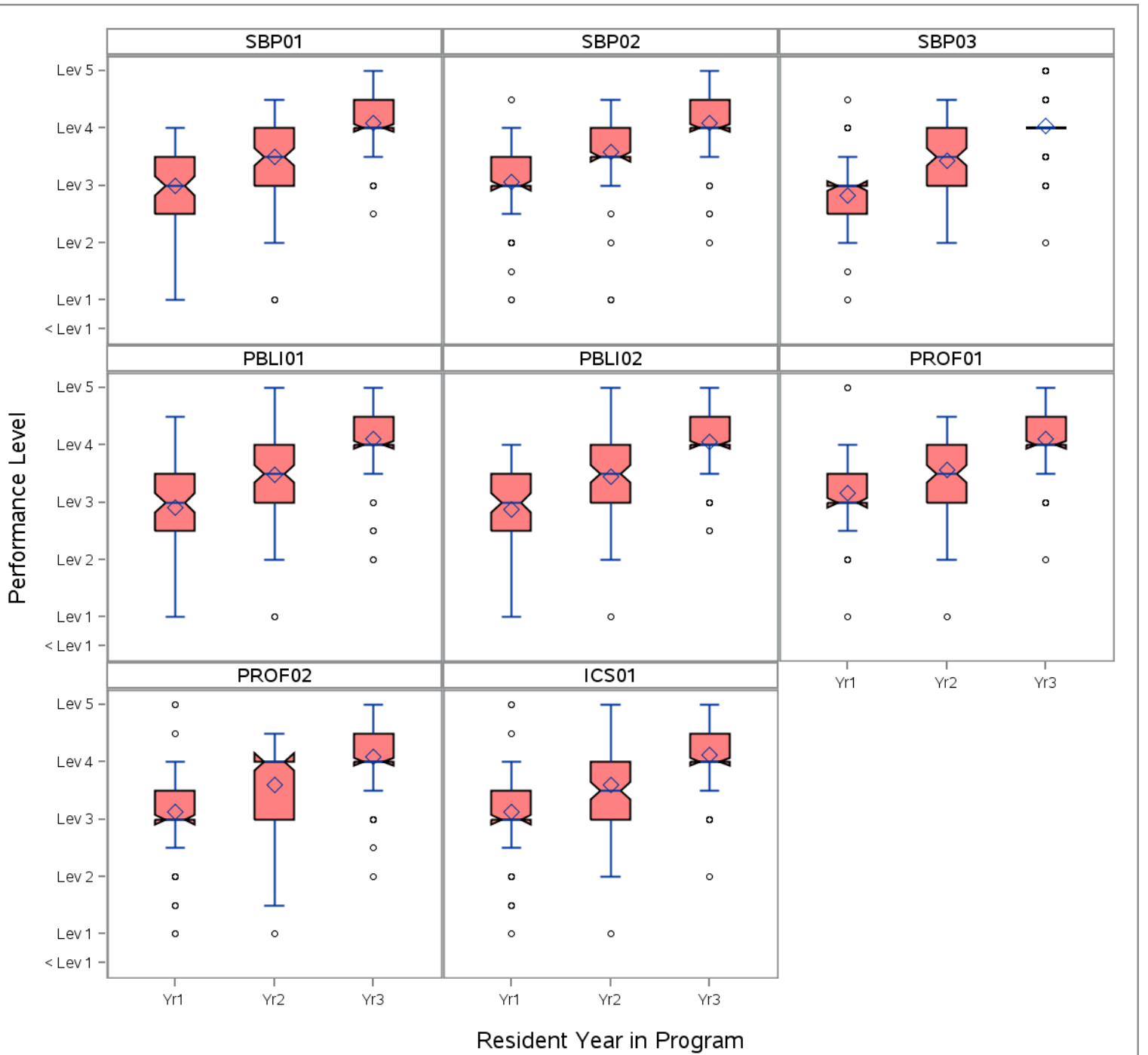
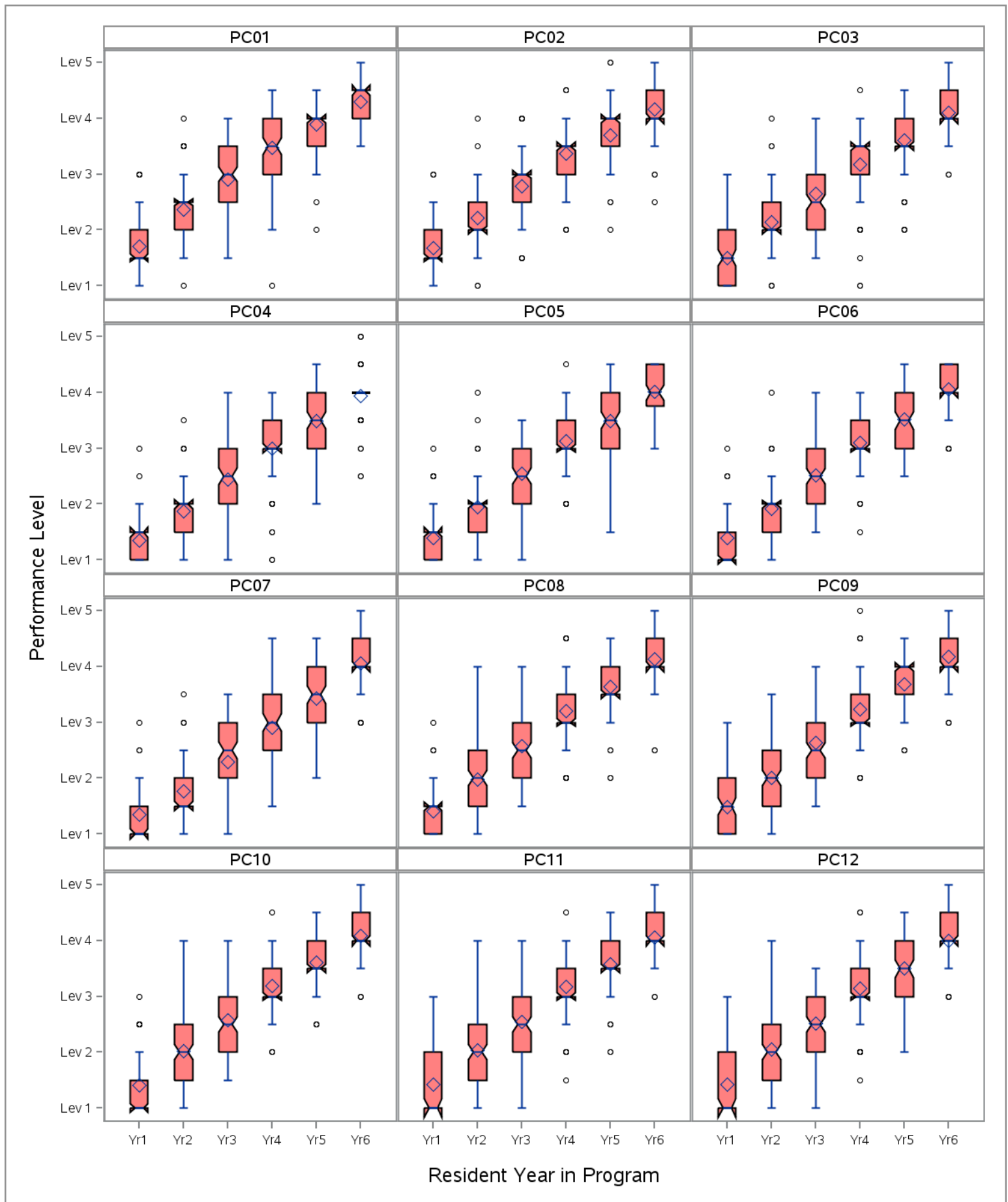
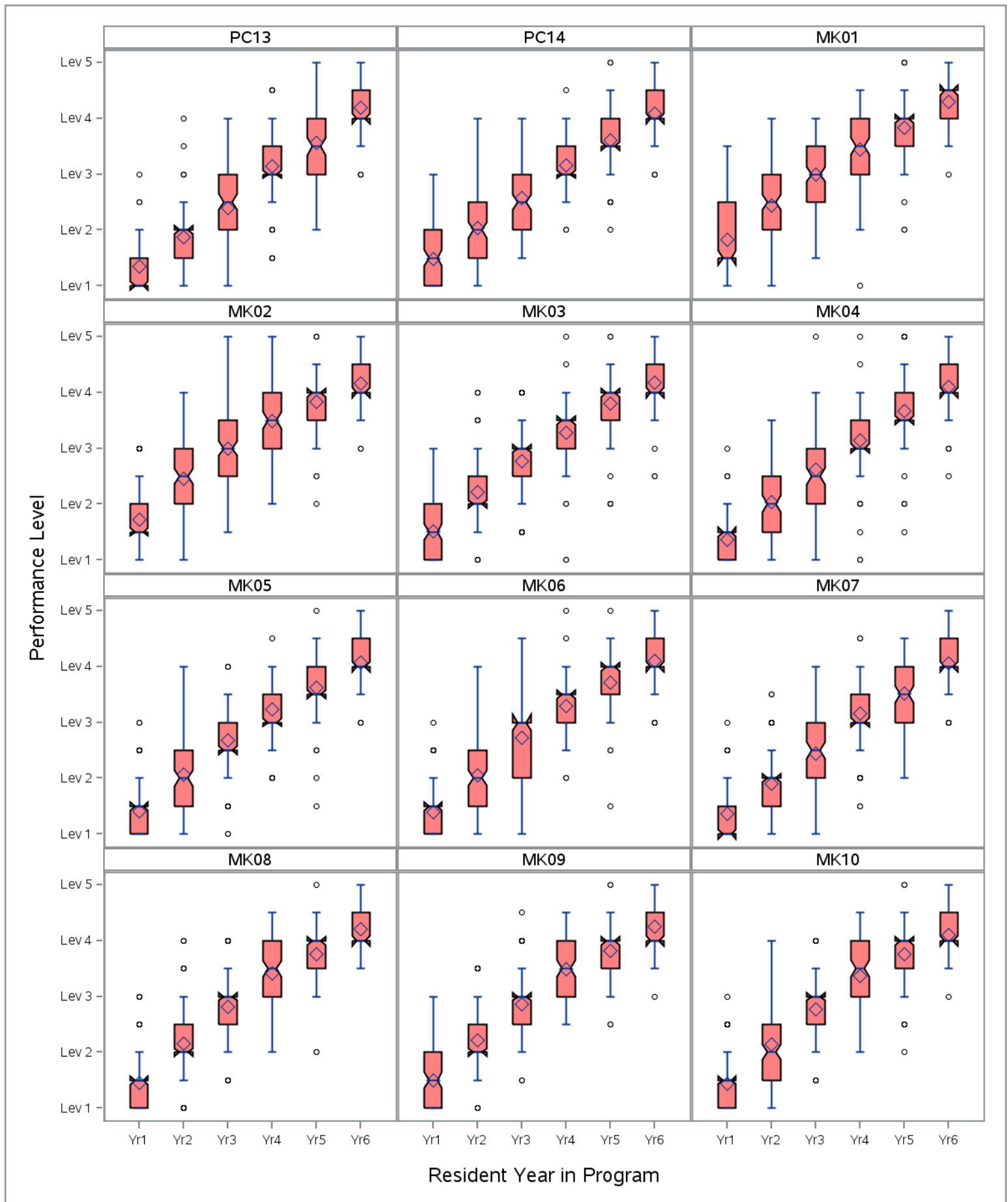


Table 107 - Plastic Surgery - Integrated (June 2017)



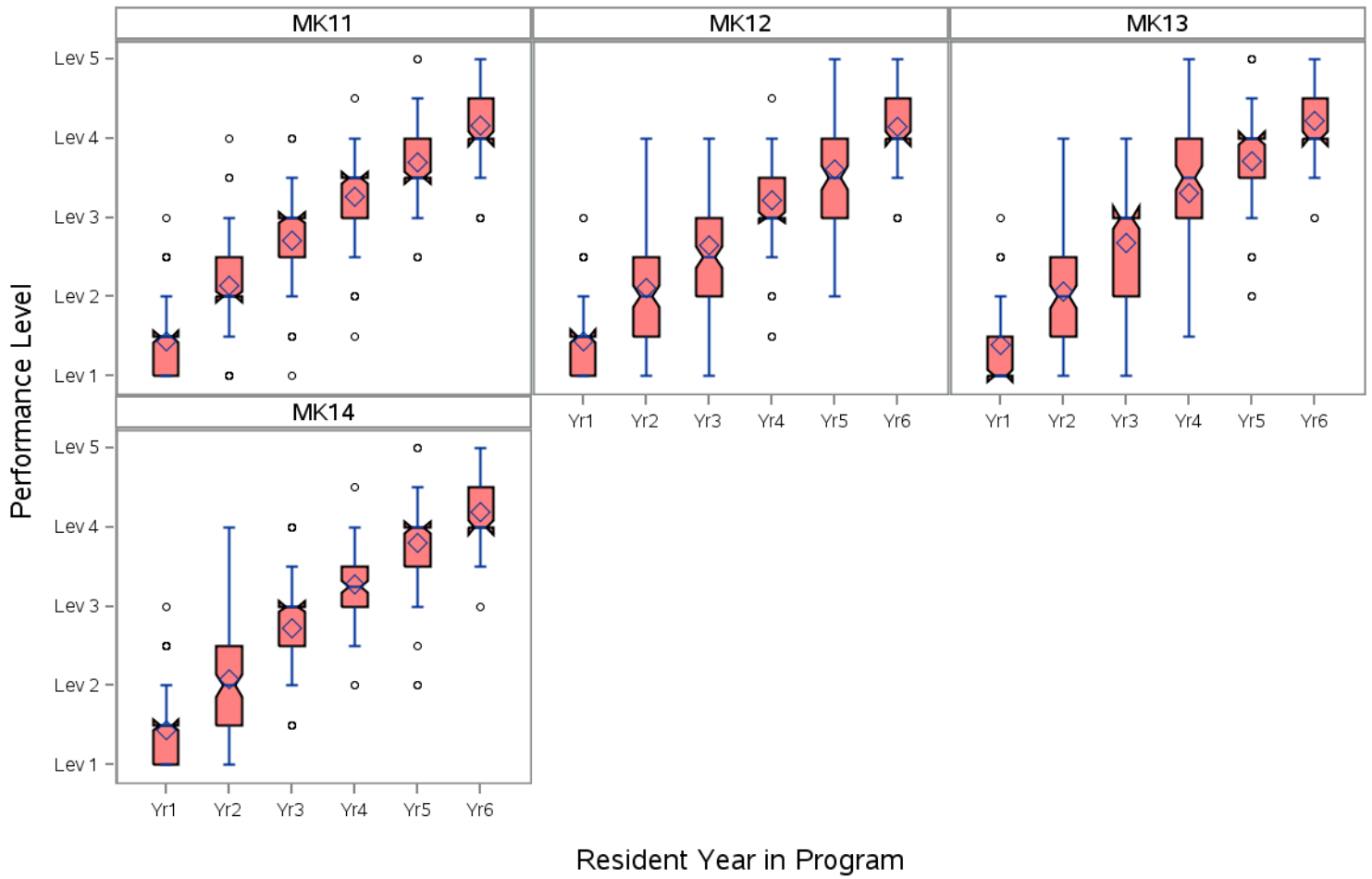
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Table 107 - Plastic Surgery - Integrated (June 2017)



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Table 107 - Plastic Surgery - Integrated (June 2017)



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Table 107 - Plastic Surgery - Integrated (June 2017)

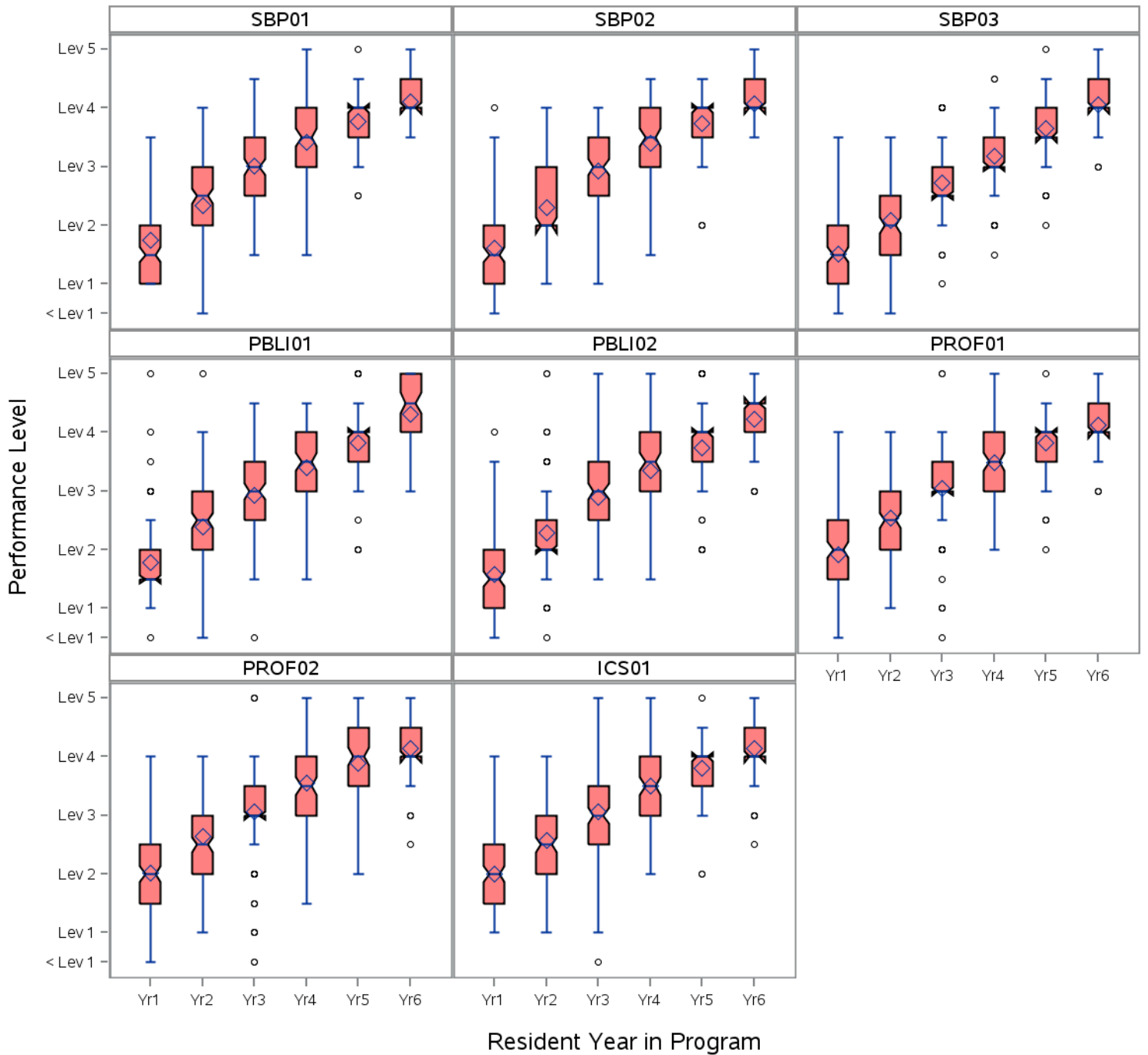


Table 108 - Craniofacial surgery (June 2017)

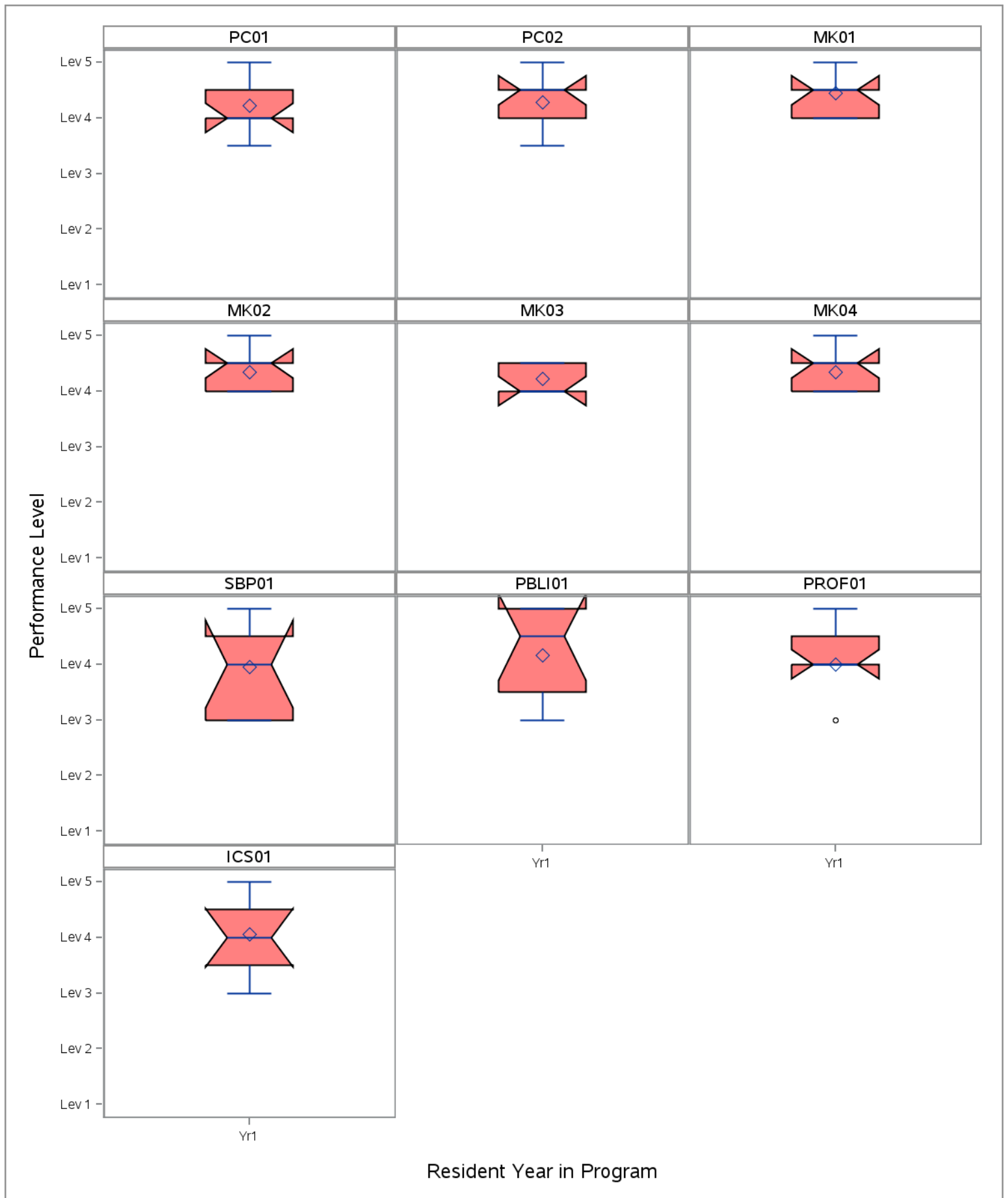
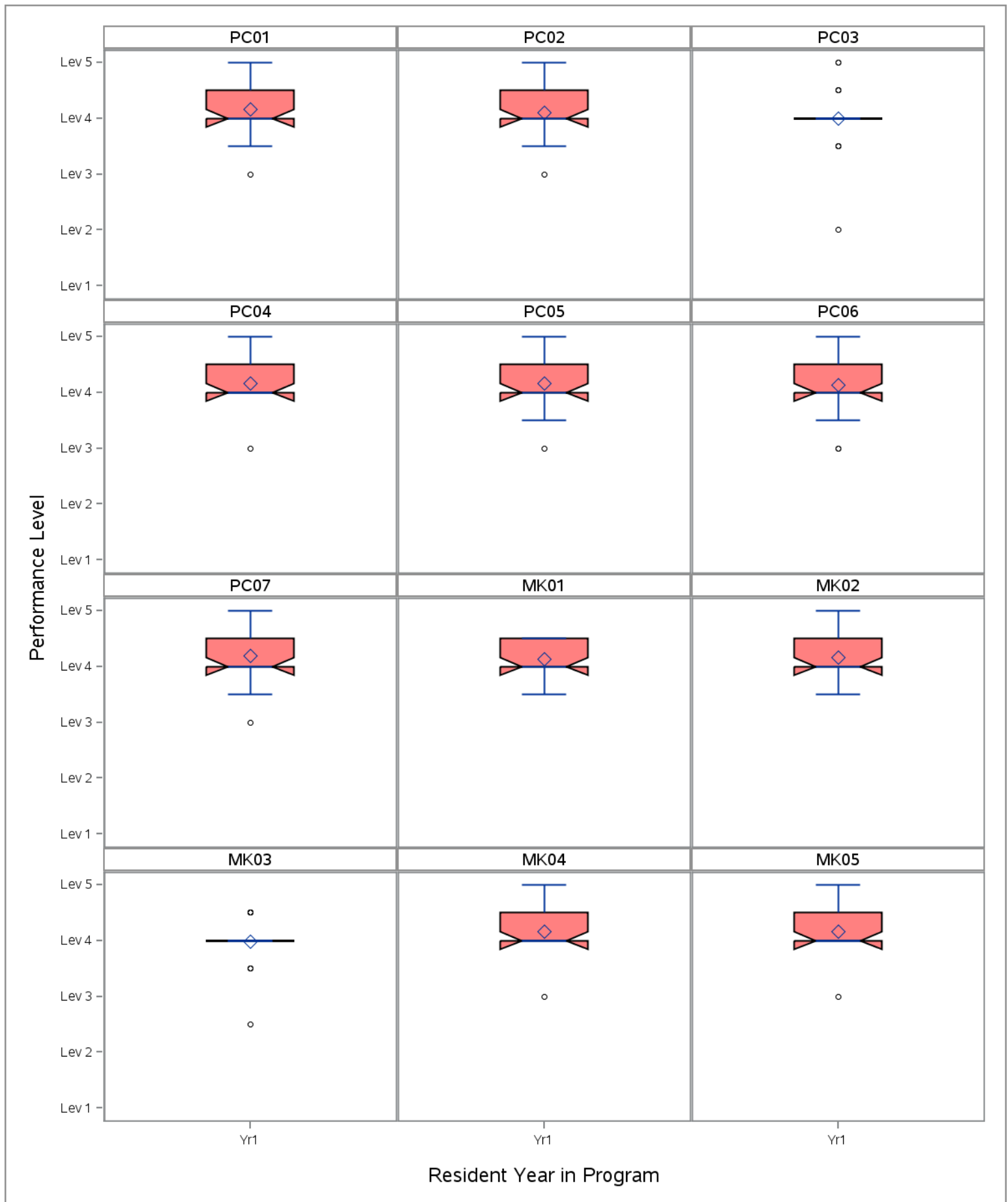


Table 109 - Hand surgery (June 2017)



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Table 109 - Hand surgery (June 2017)

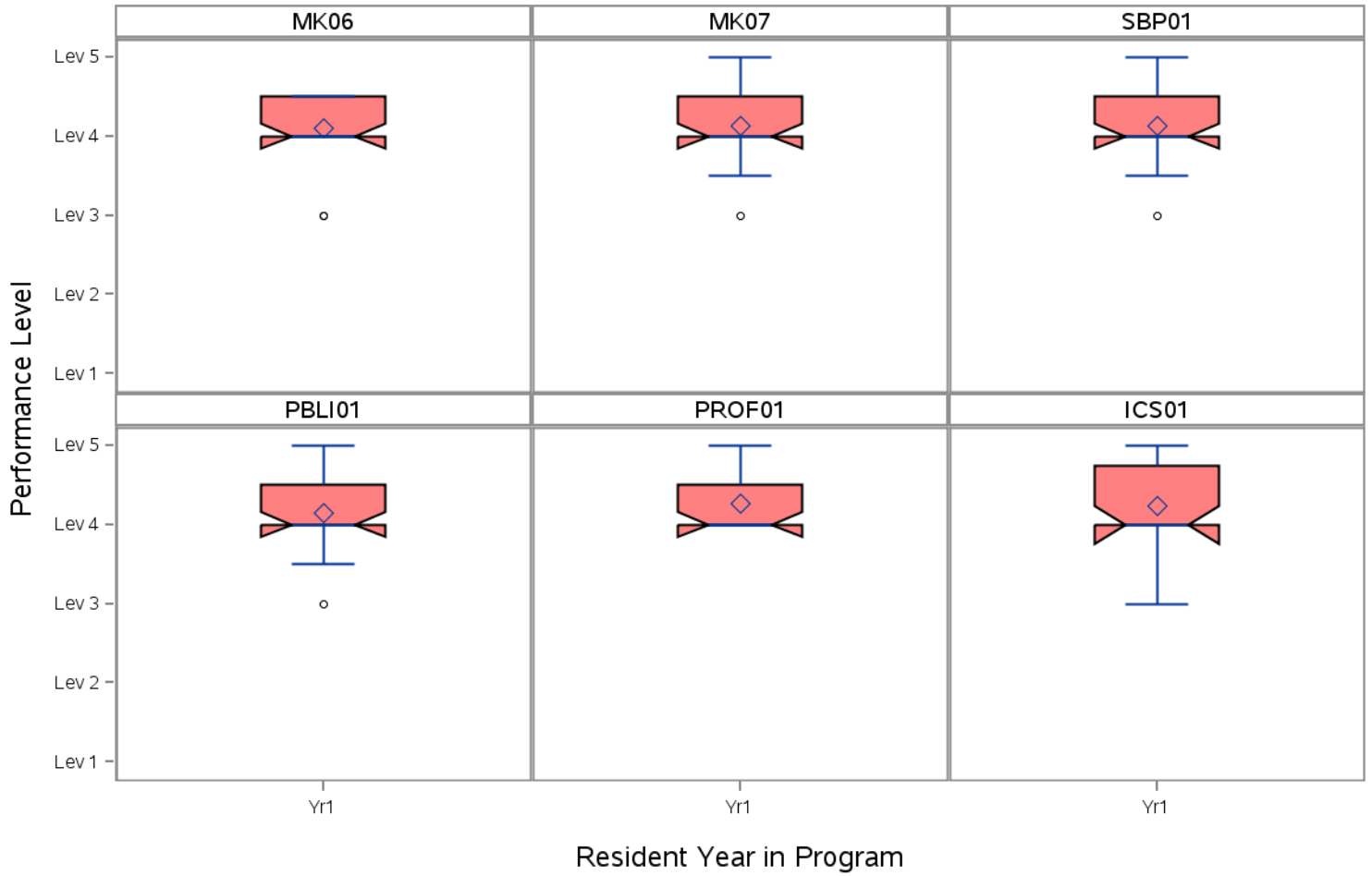
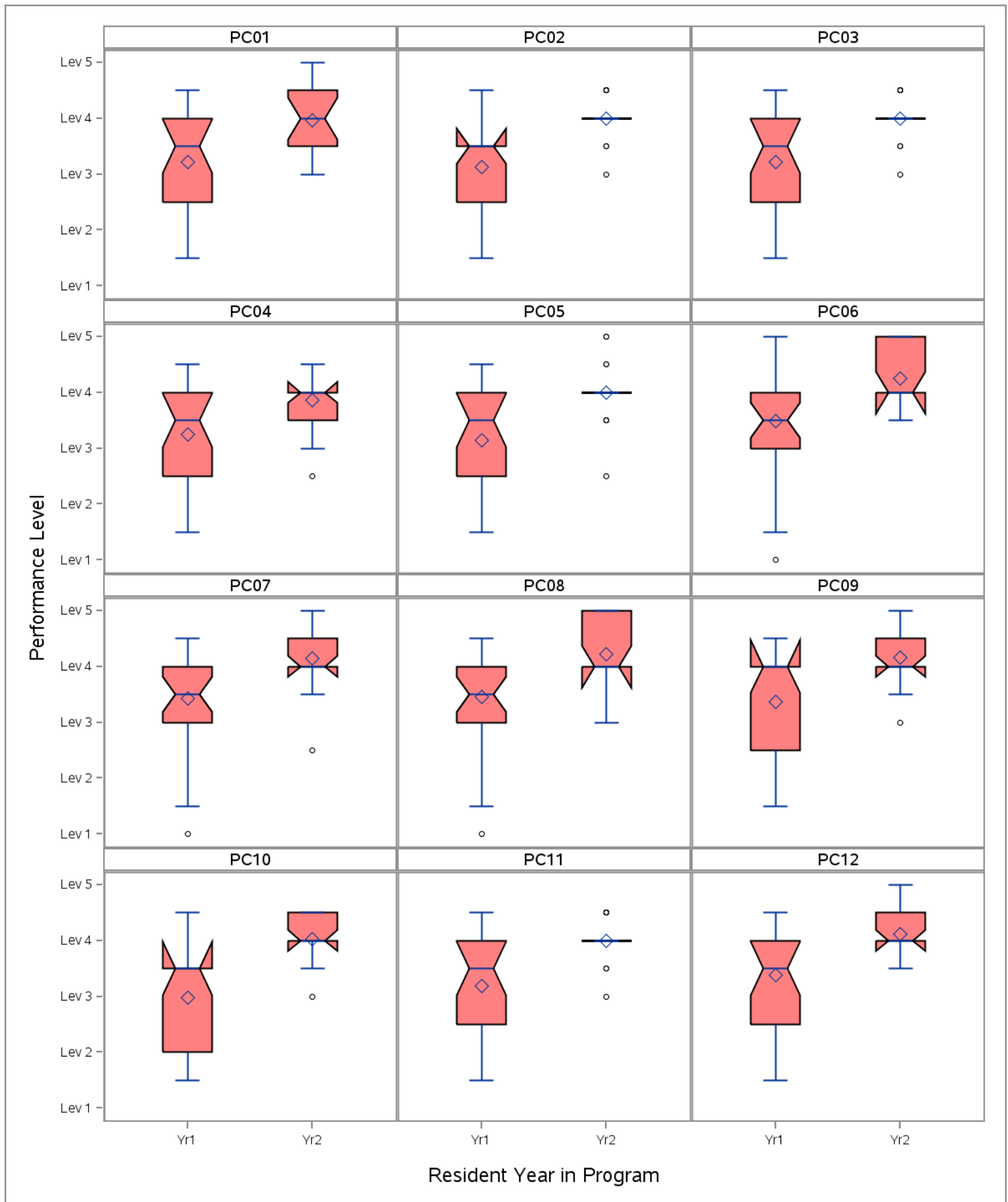
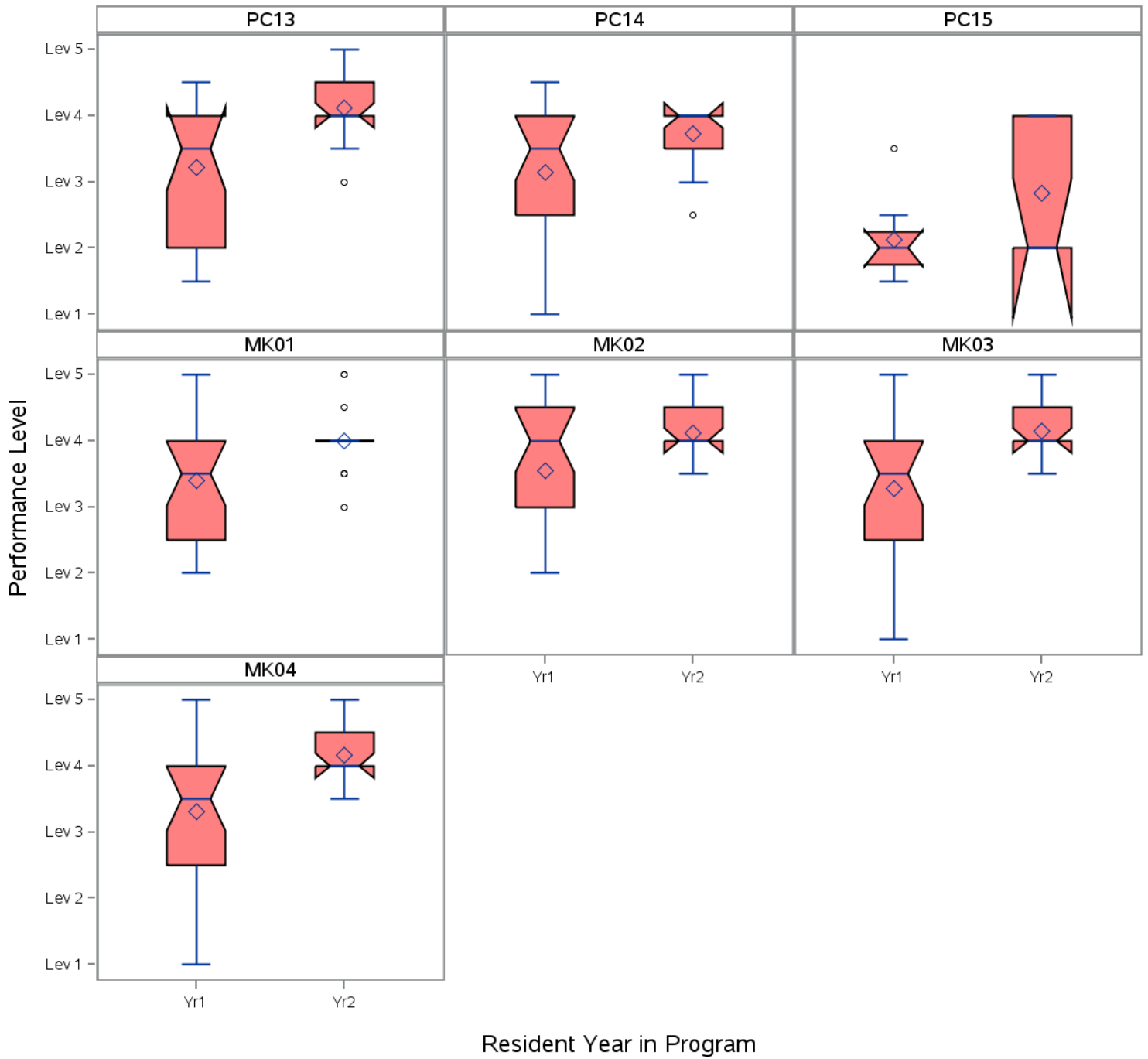


Table 110 - Preventive medicine-aerospace medicine (June 2017)



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Table 110 - Preventive medicine-aerospace medicine (June 2017)



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Table 110 - Preventive medicine-aerospace medicine (June 2017)

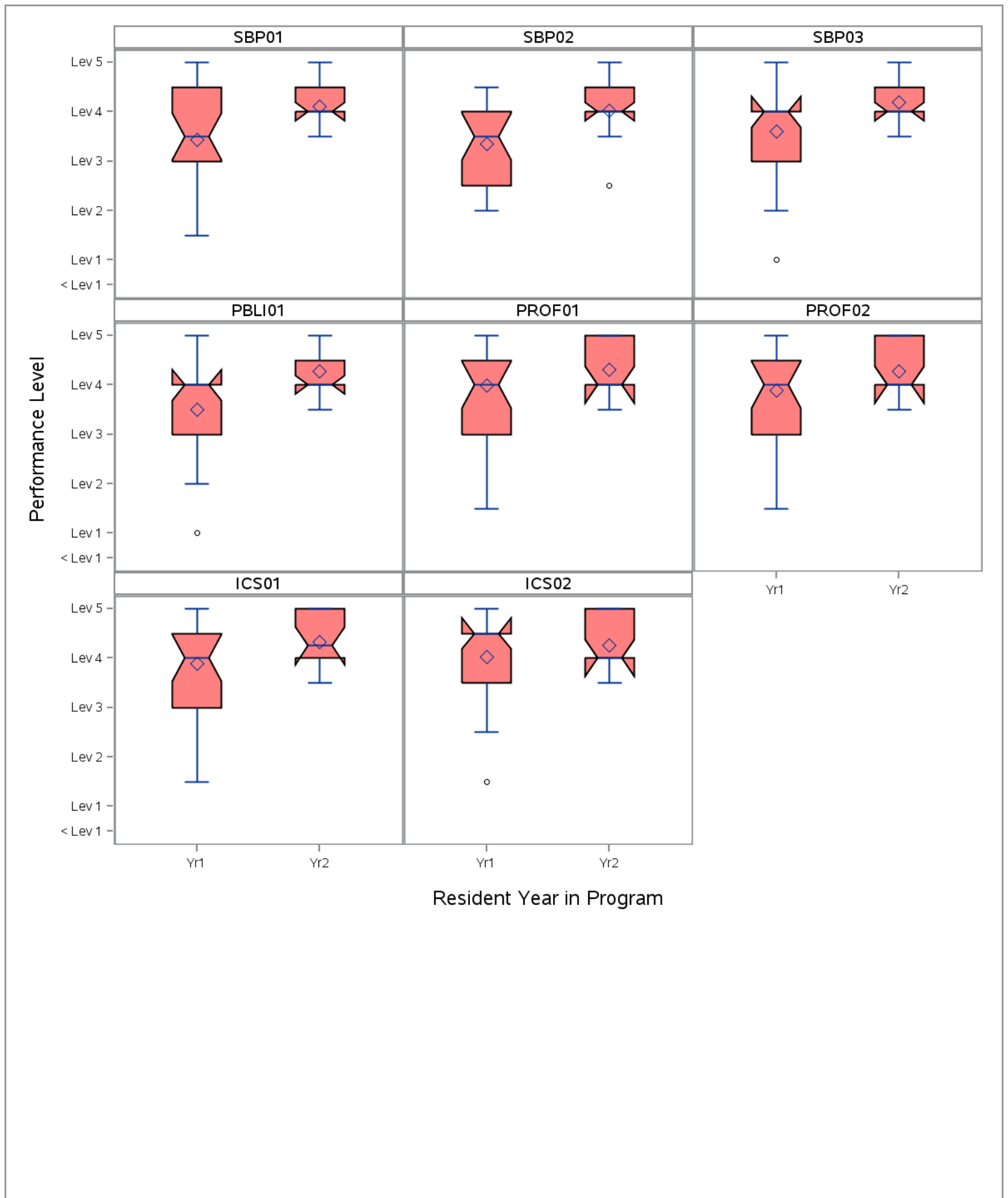


Table 111 - Preventive medicine-occupational medicine (June 2017)

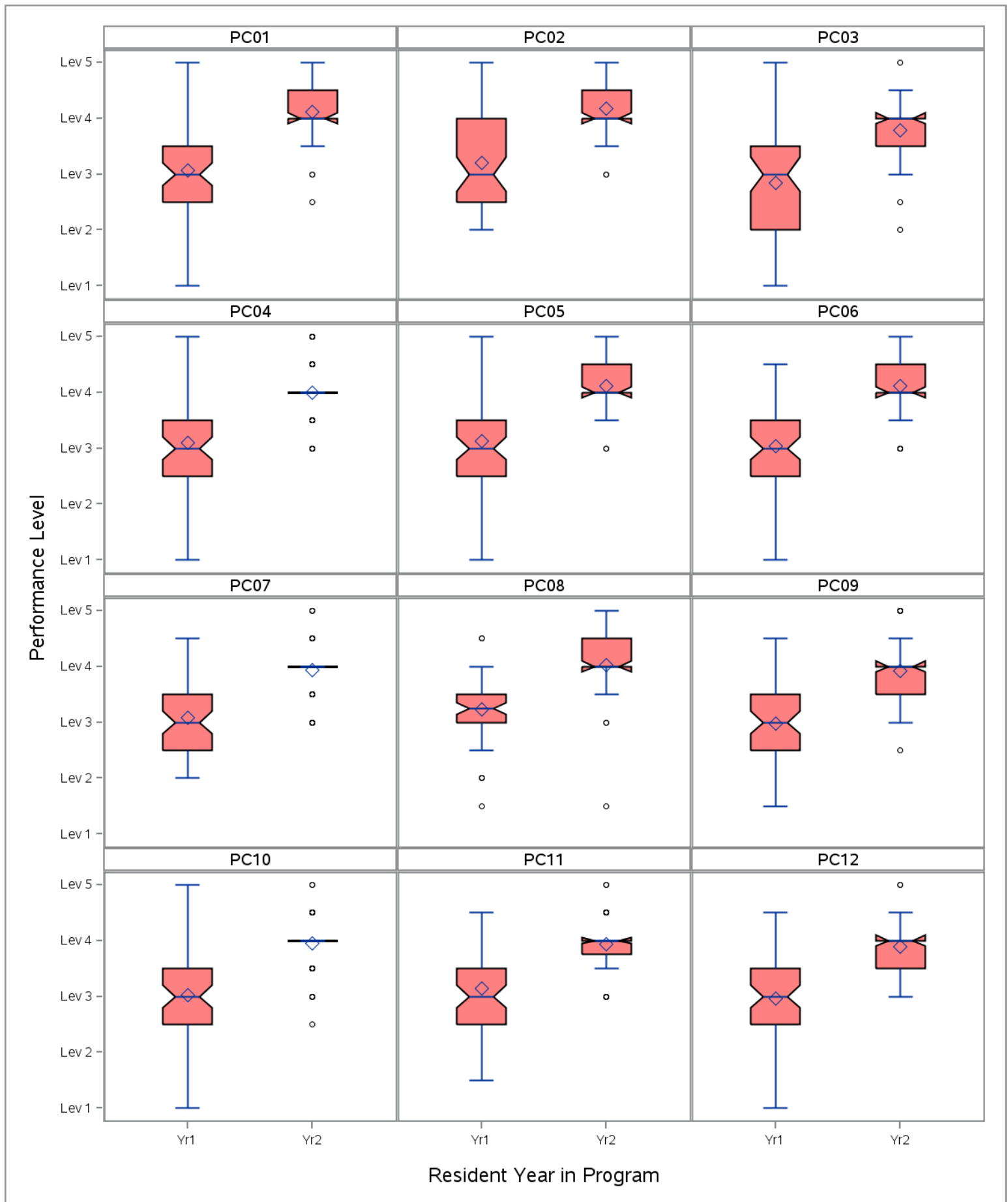
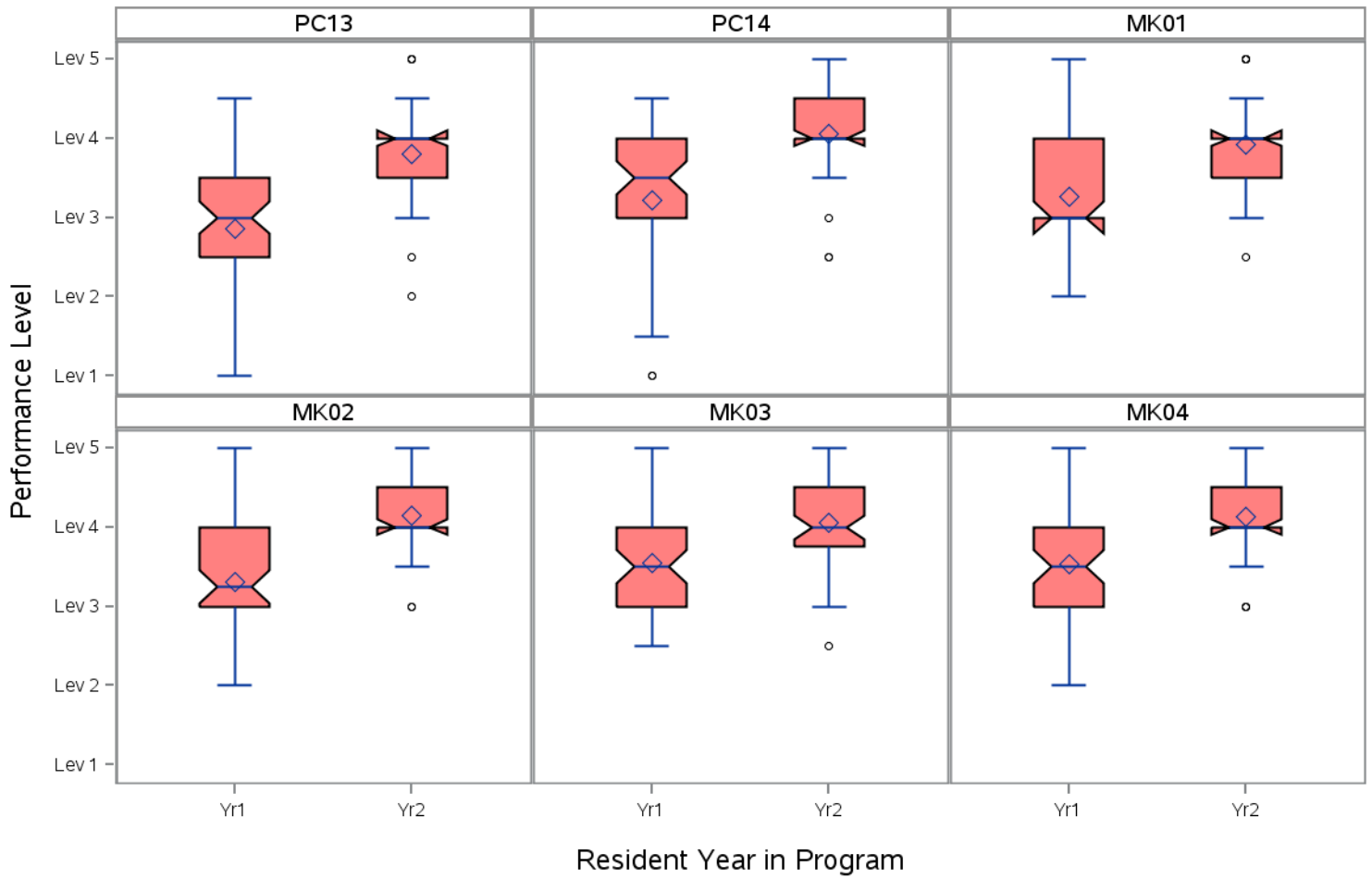
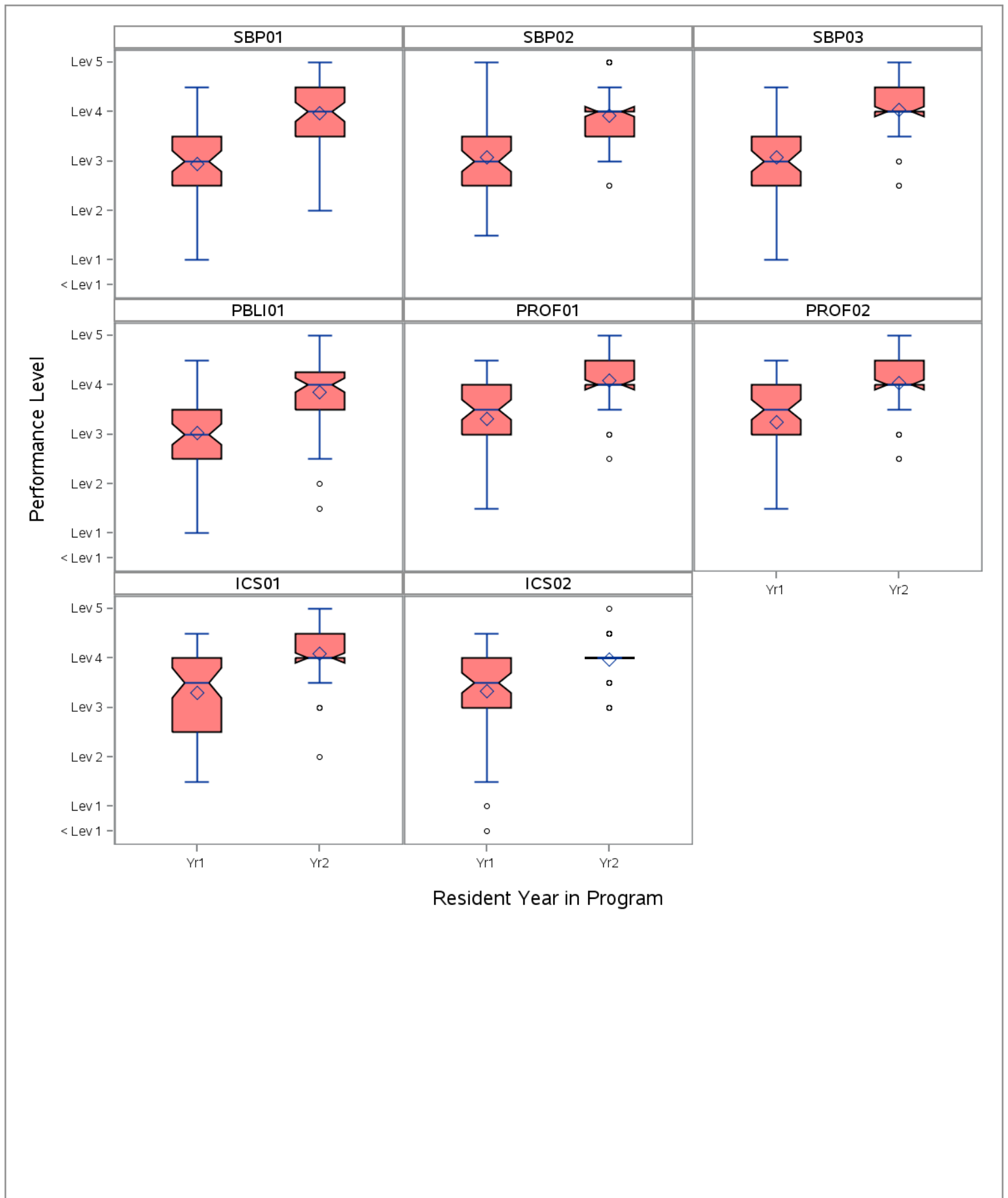


Table 111 - Preventive medicine-occupational medicine (June 2017)



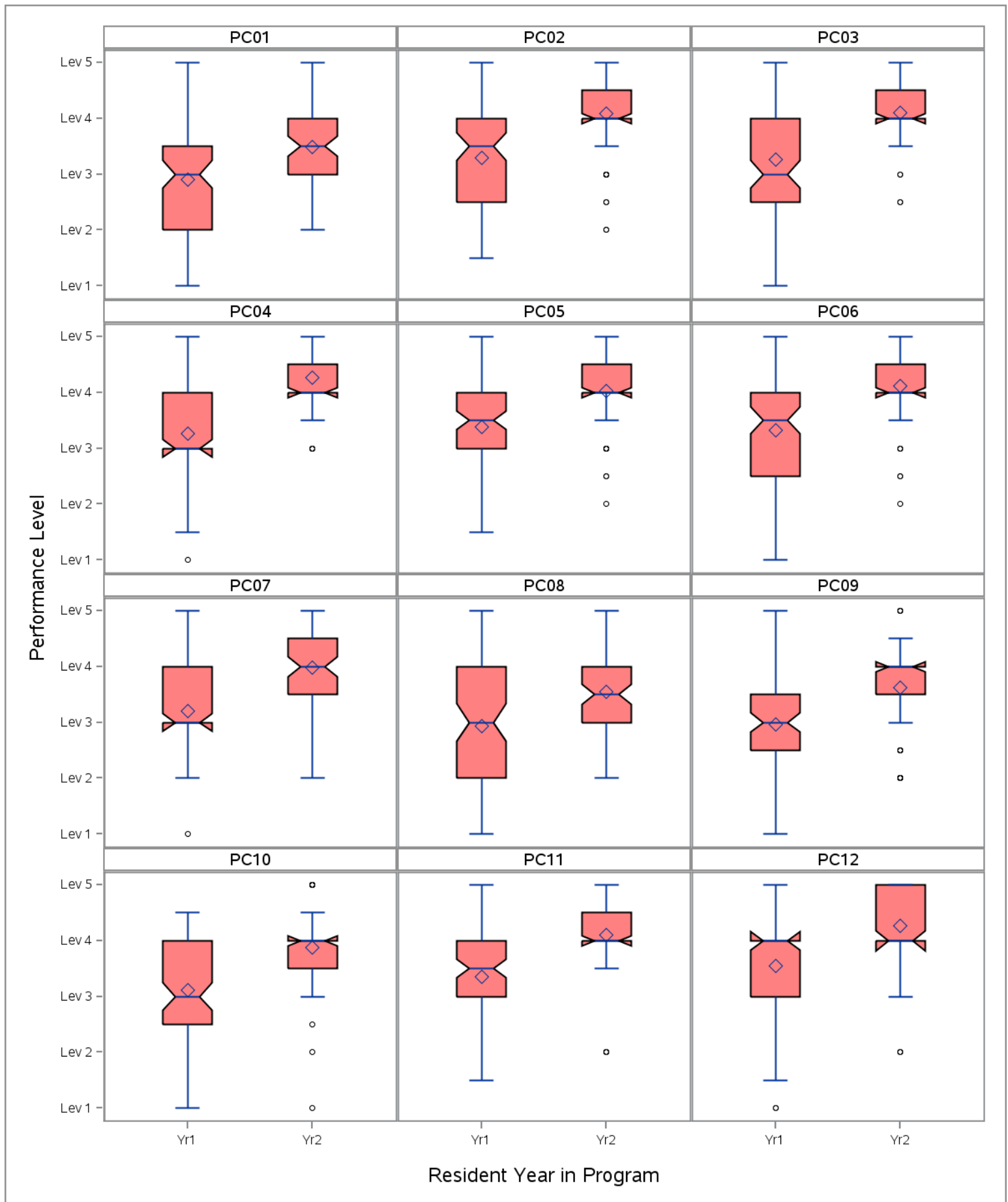
Continue to next page for Preventive medicine-occupational medicine

Table 111 - Preventive medicine-occupational medicine (June 2017)



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Table 112 - Preventive medicine-public health and general preventive medicine (June 2017)



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Table 112 - Preventive medicine-public health and general preventive medicine (June 2017)

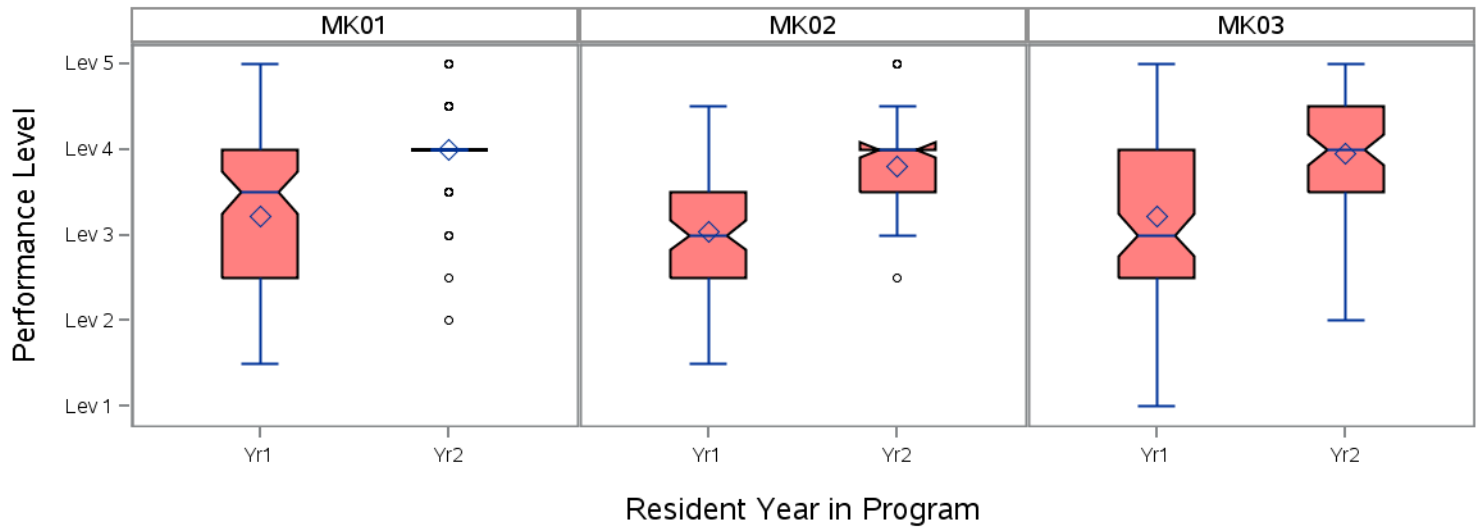


Table 112 - Preventive medicine-public health and general preventive medicine (June 2017)

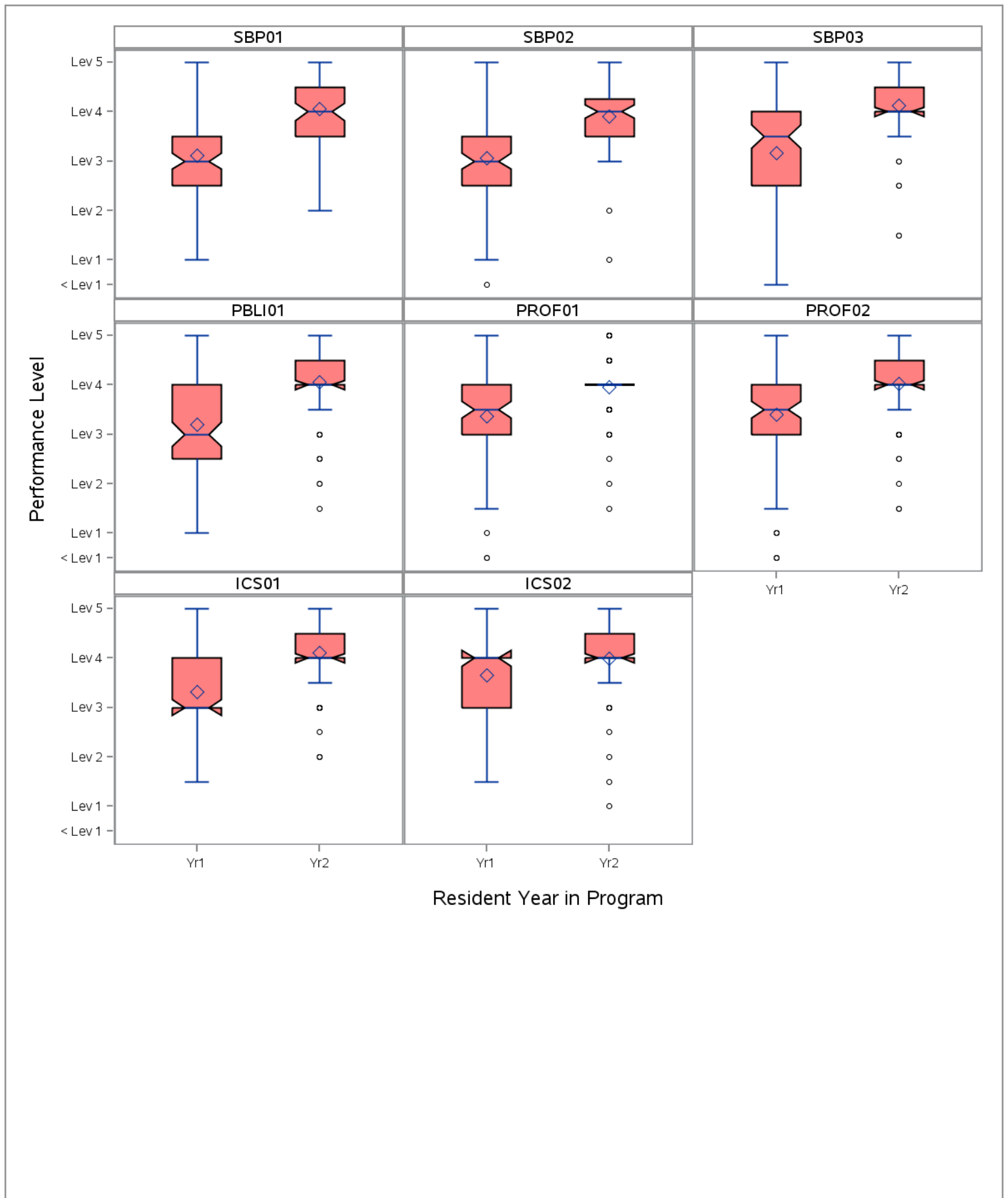
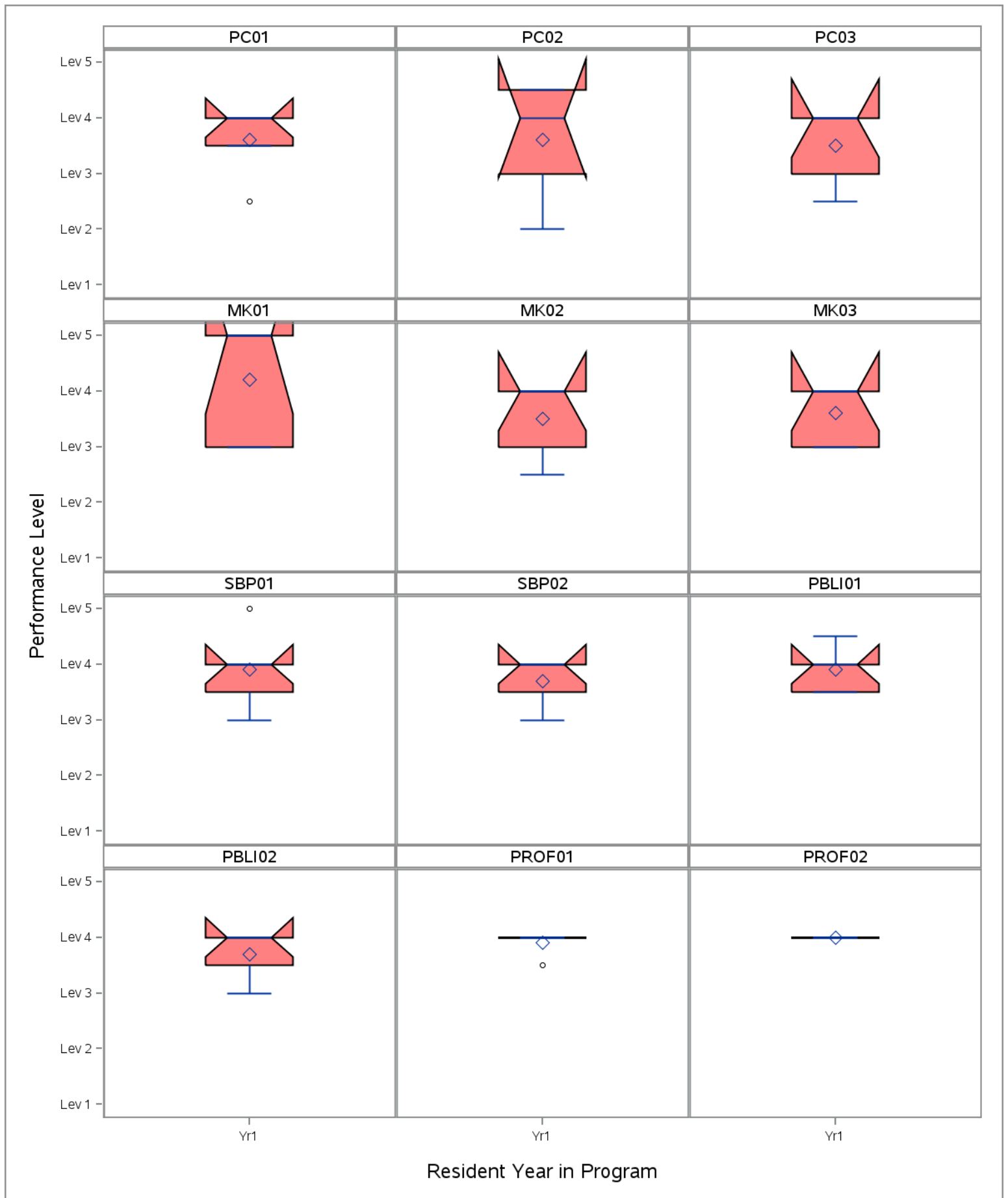


Table 113 - Medical toxicology (June 2017)



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Table 113 - Medical toxicology (June 2017)

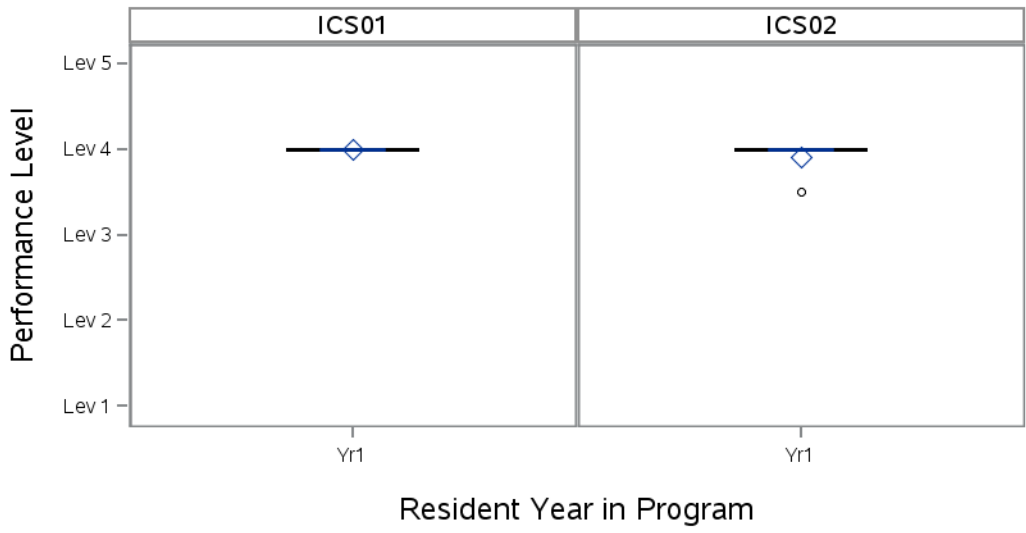
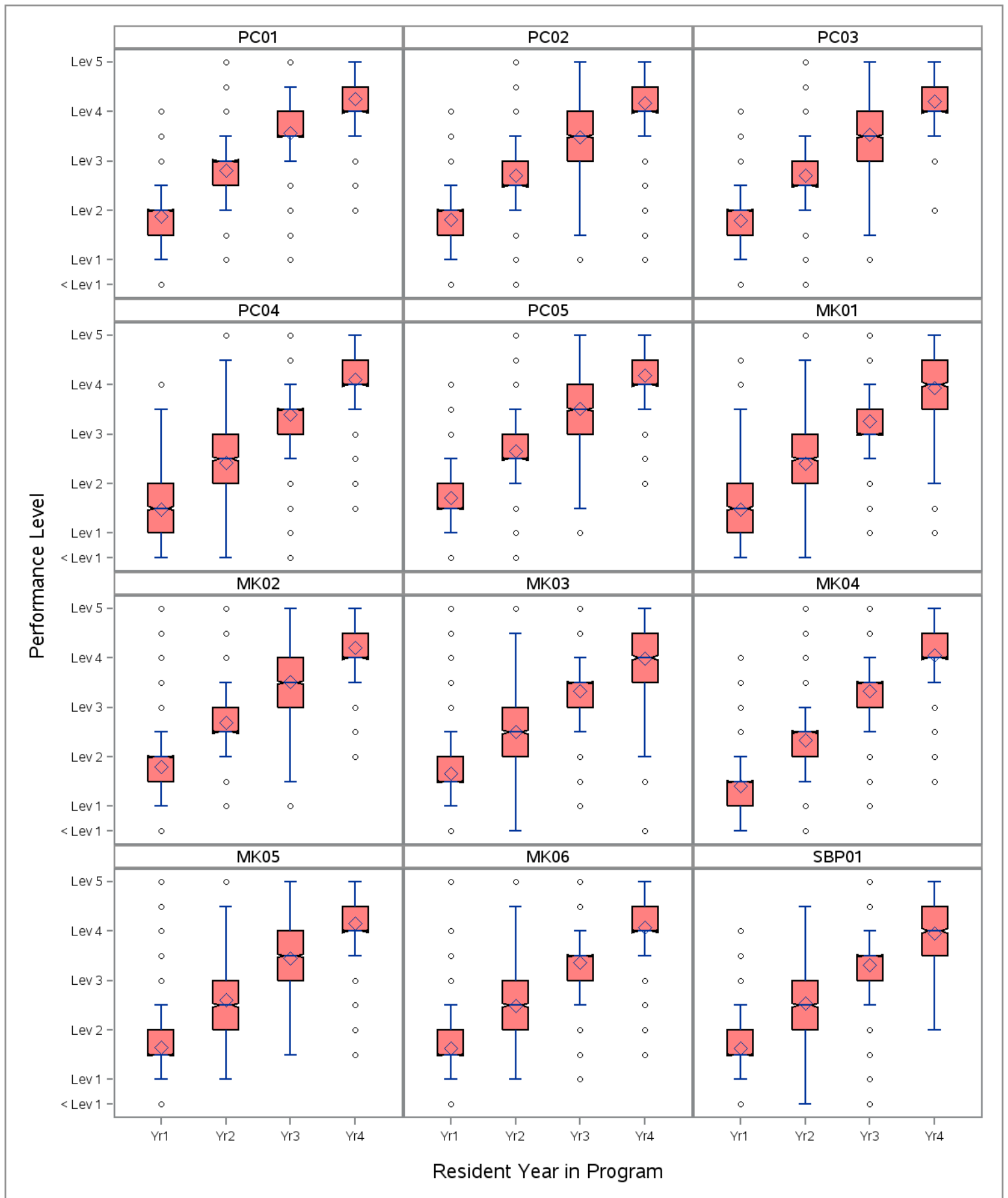


Table 114 - Psychiatry (June 2017)



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Table 114 - Psychiatry (June 2017)

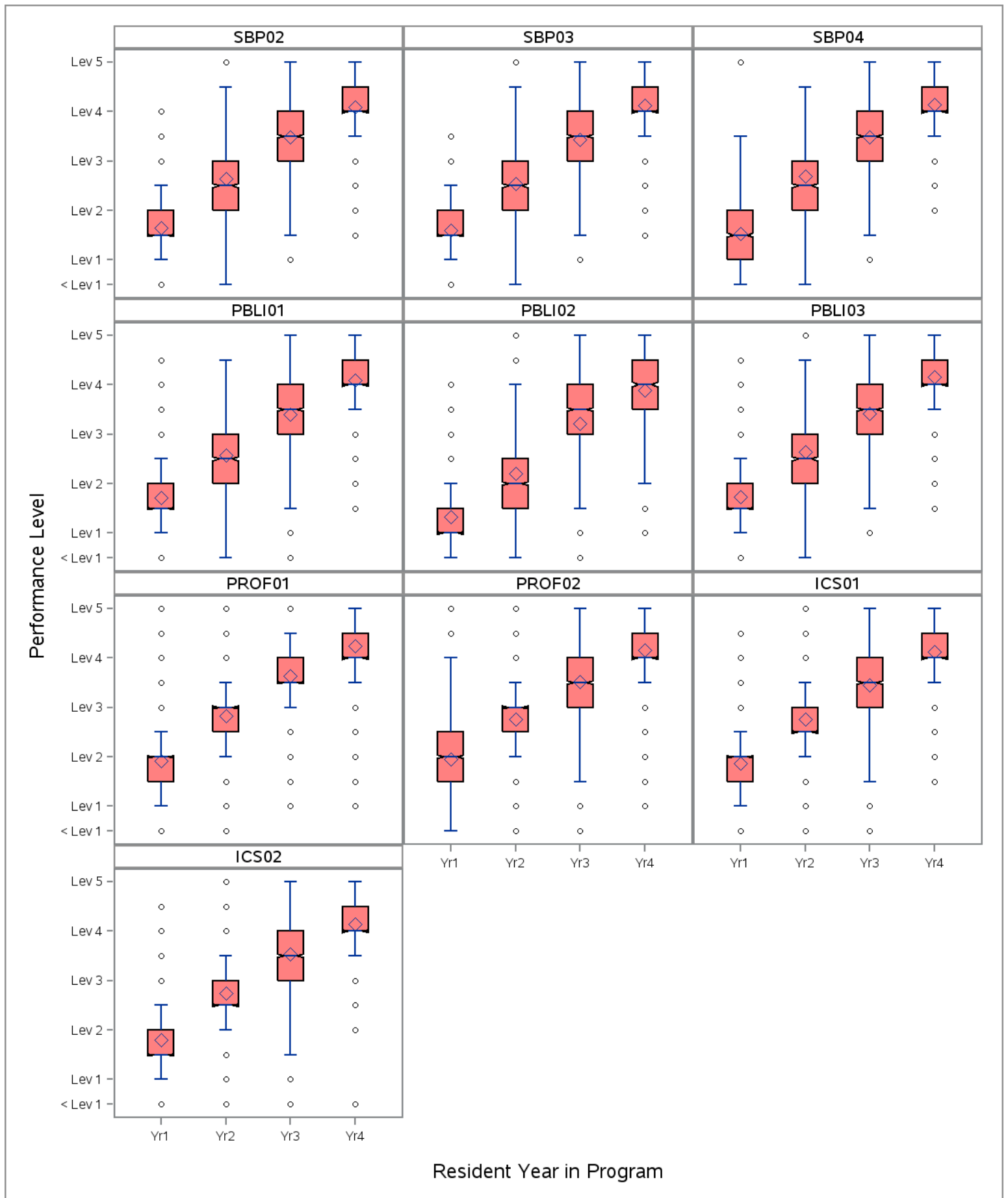
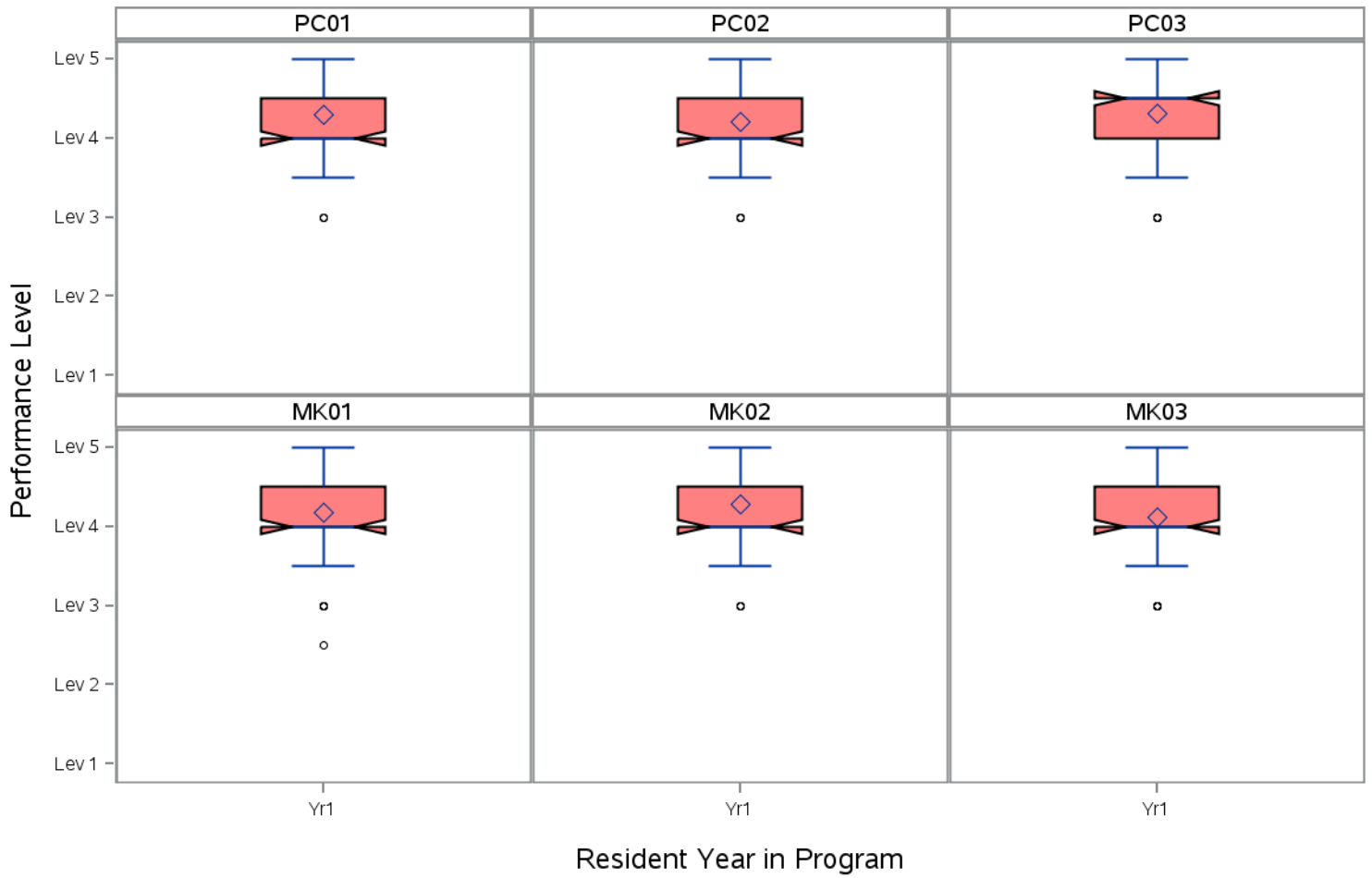


Table 115 - Addiction psychiatry (June 2017)



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Table 115 - Addiction psychiatry (June 2017)

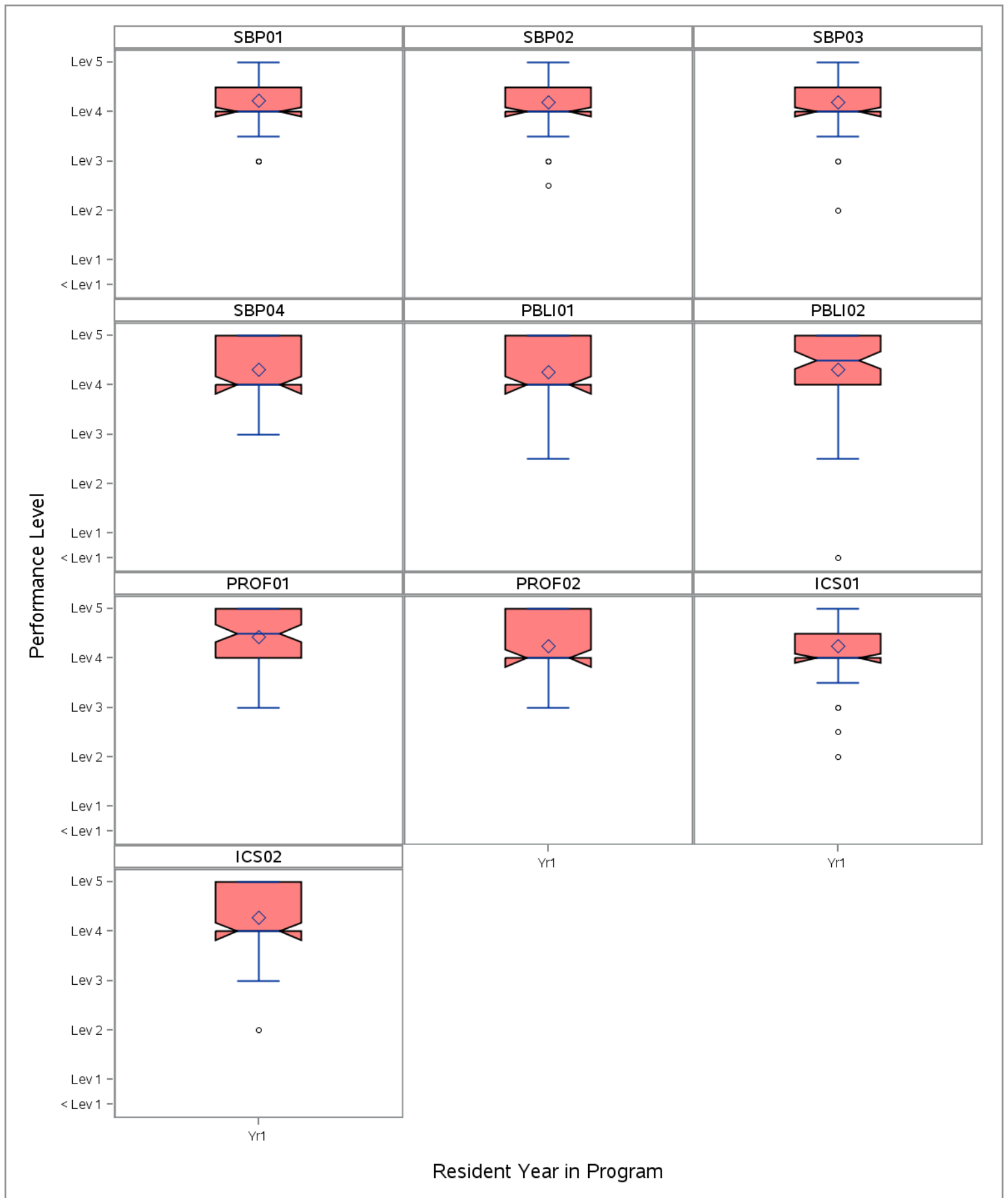
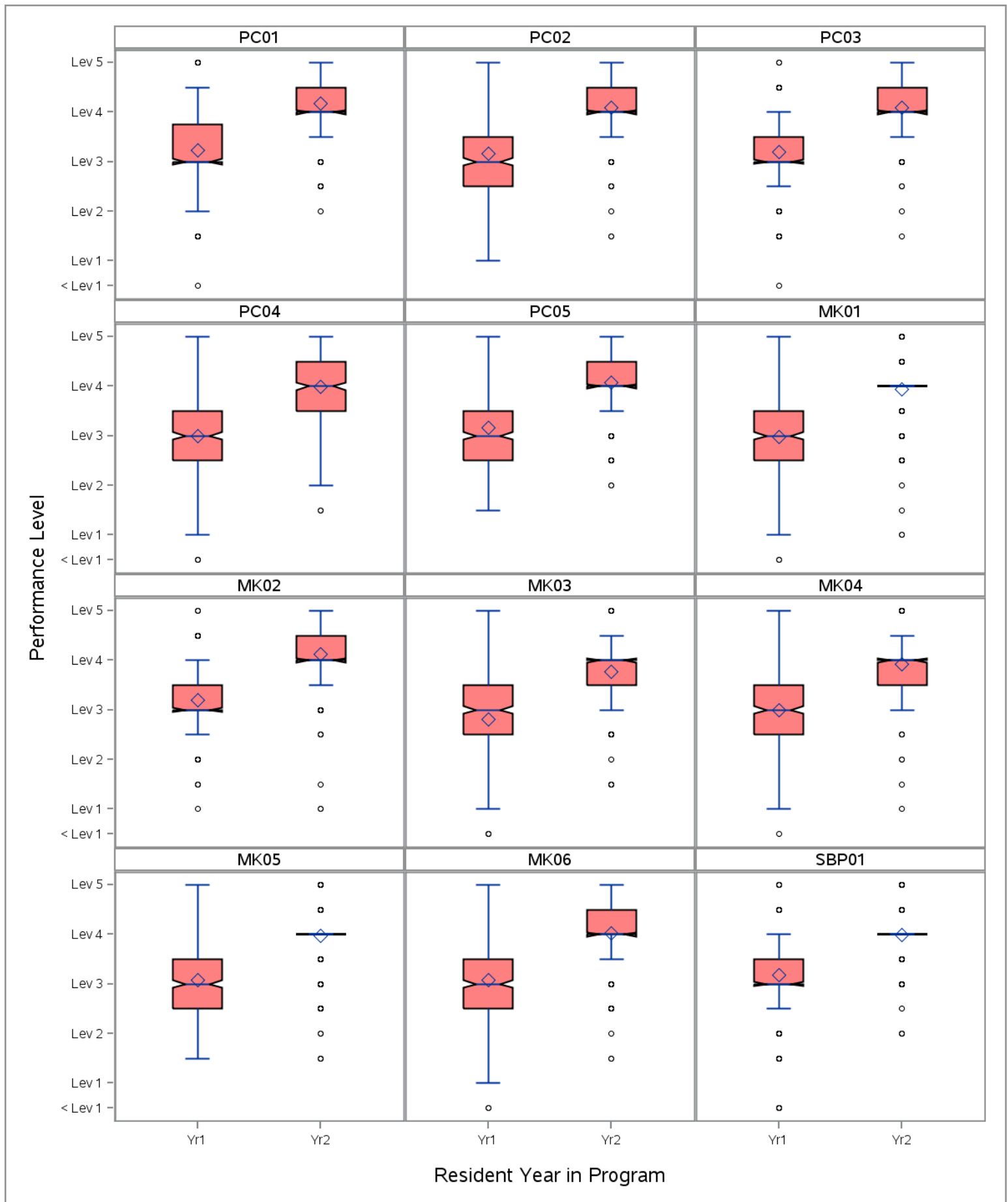


Table 116 - Child and adolescent psychiatry (June 2017)



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Table 116 - Child and adolescent psychiatry (June 2017)

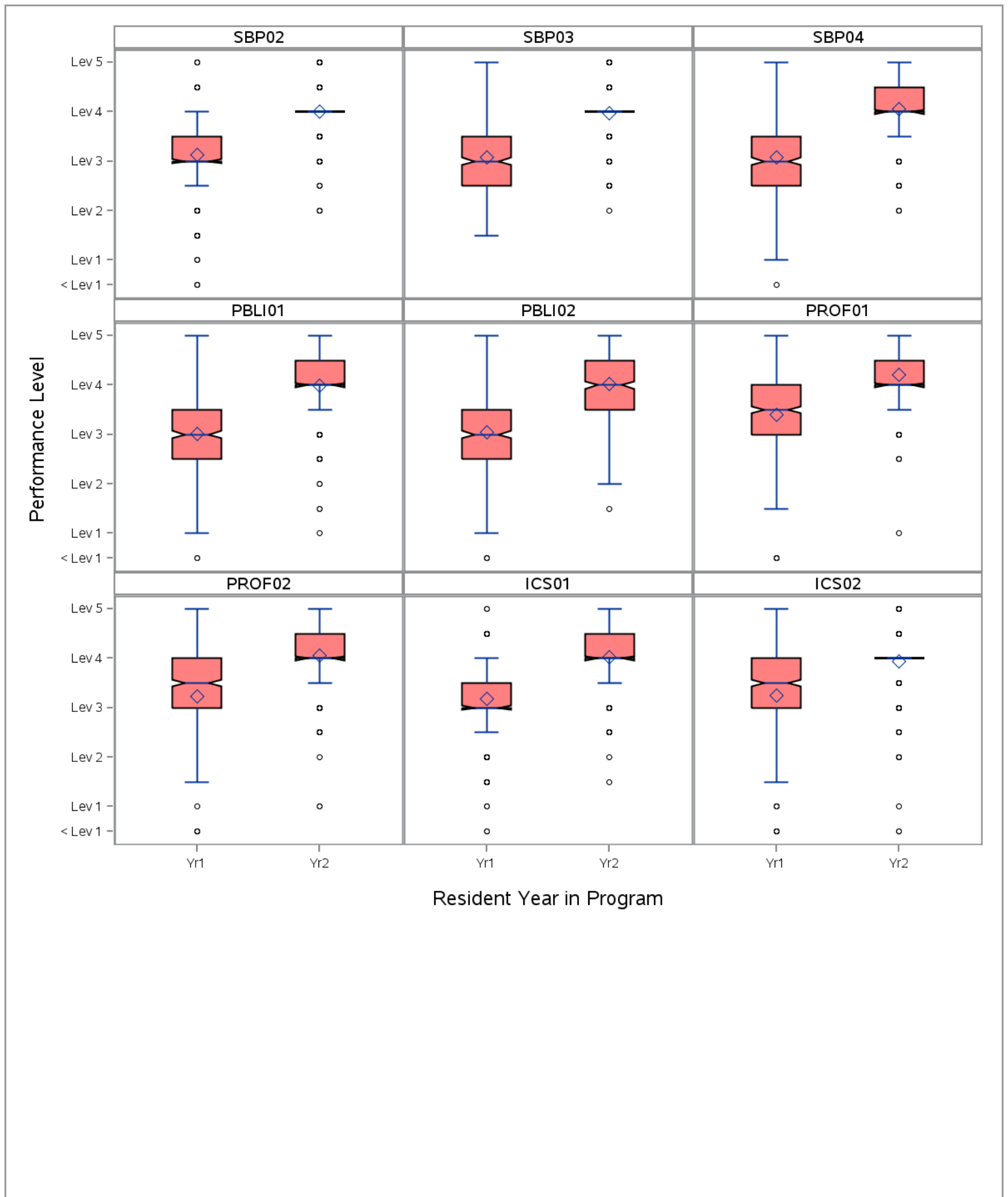
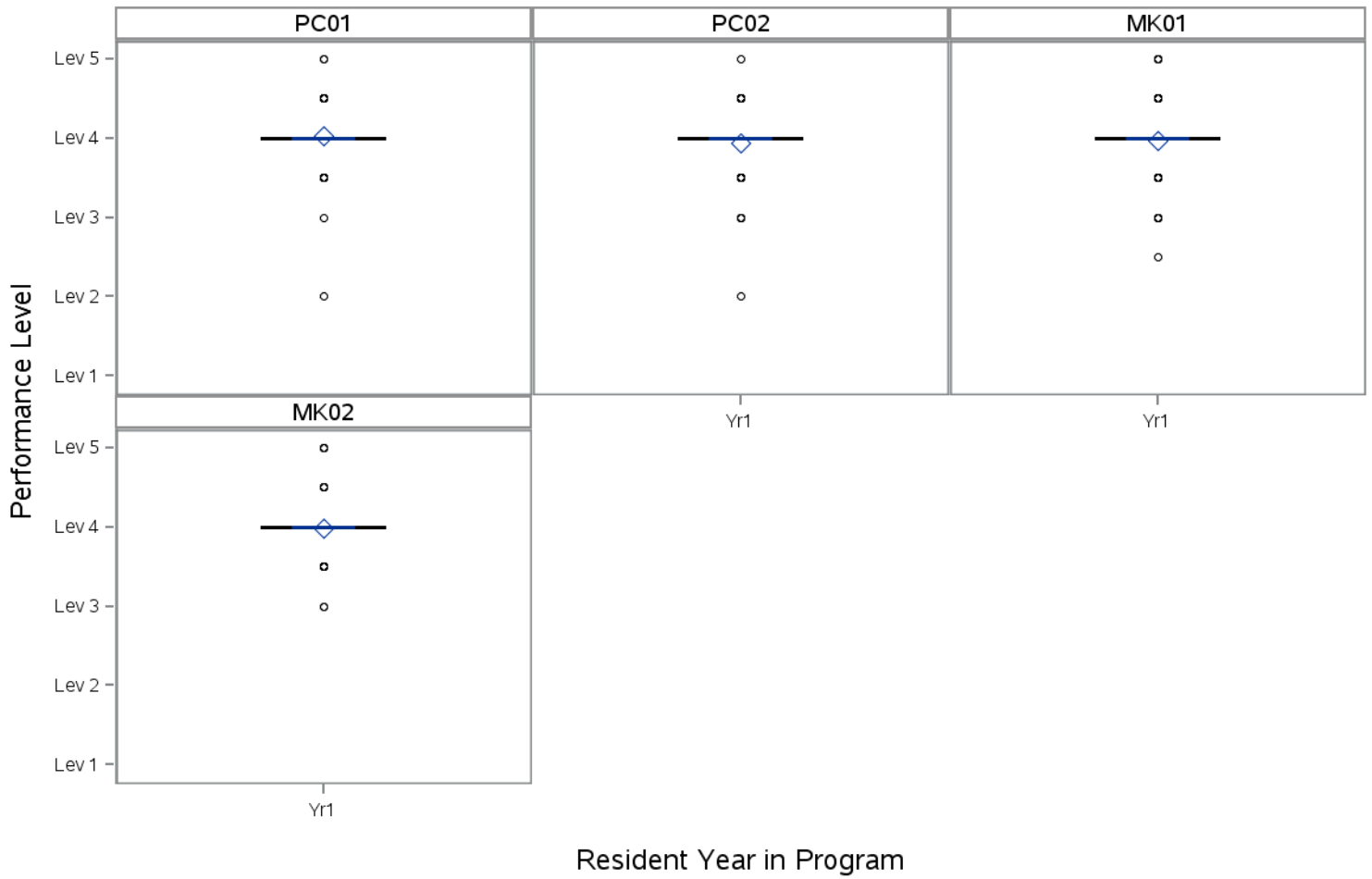


Table 117 - Forensic psychiatry (June 2017)



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Table 117 - Forensic psychiatry (June 2017)

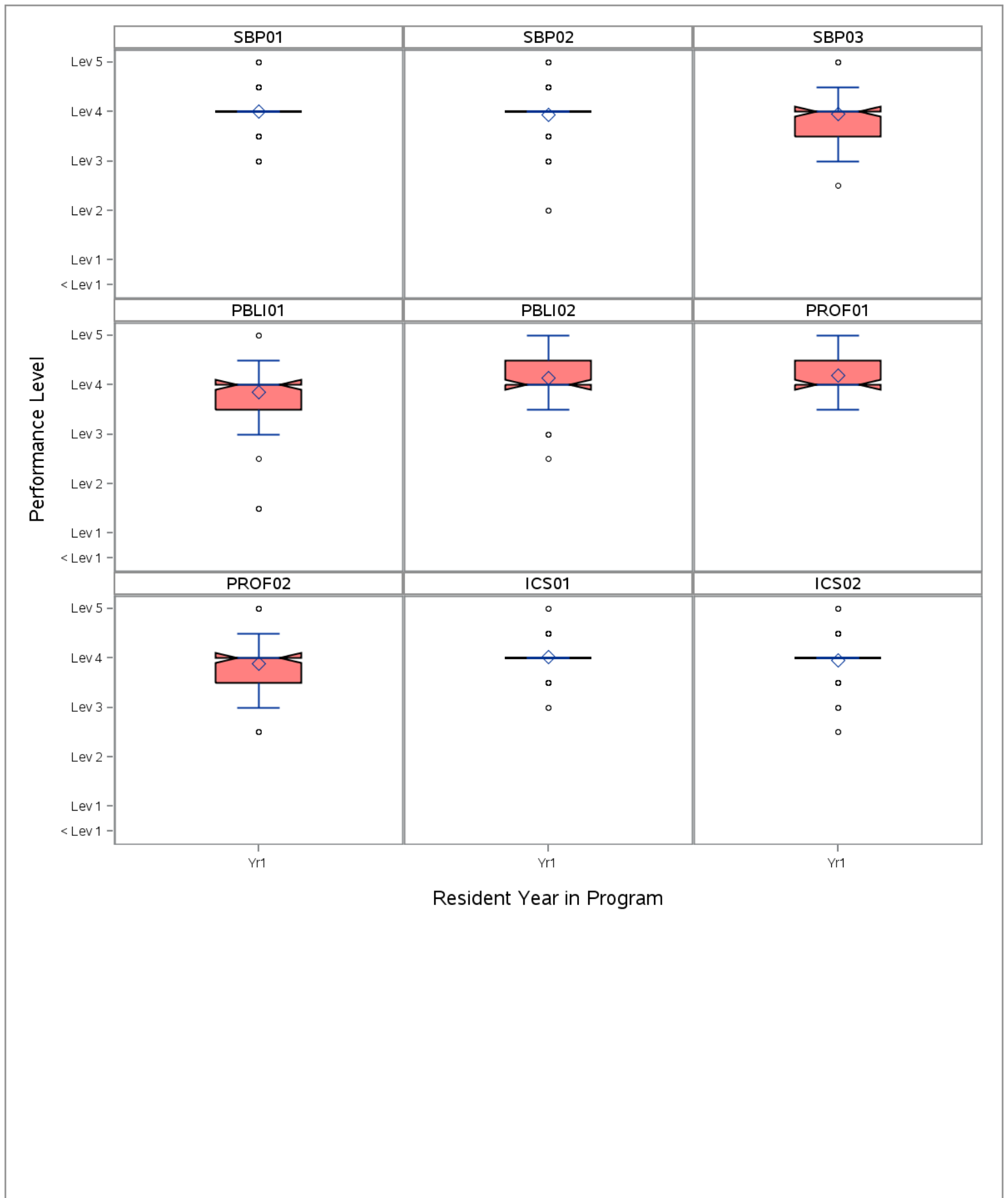
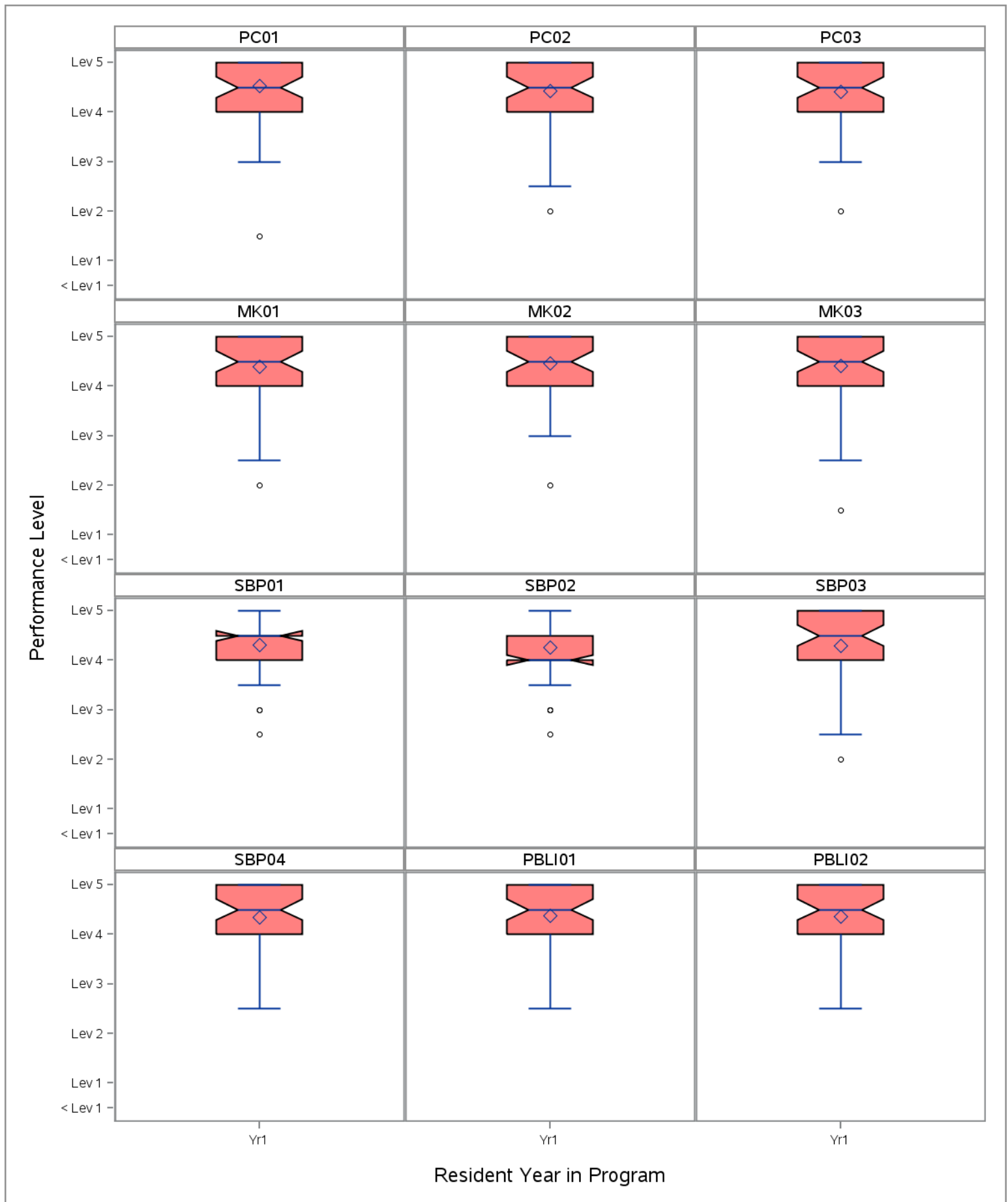


Table 118 - Geriatric psychiatry (June 2017)



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Table 118 - Geriatric psychiatry (June 2017)

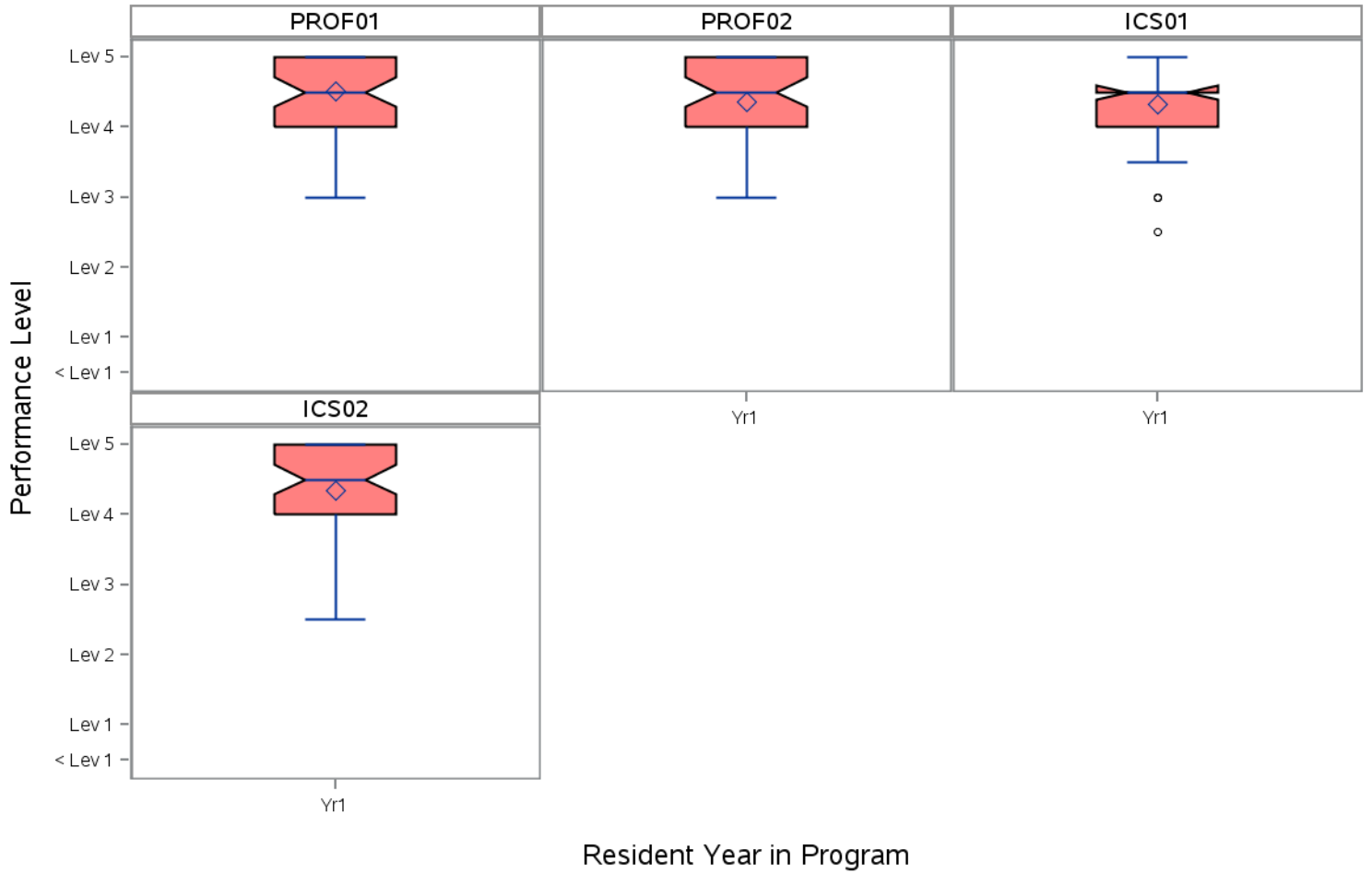
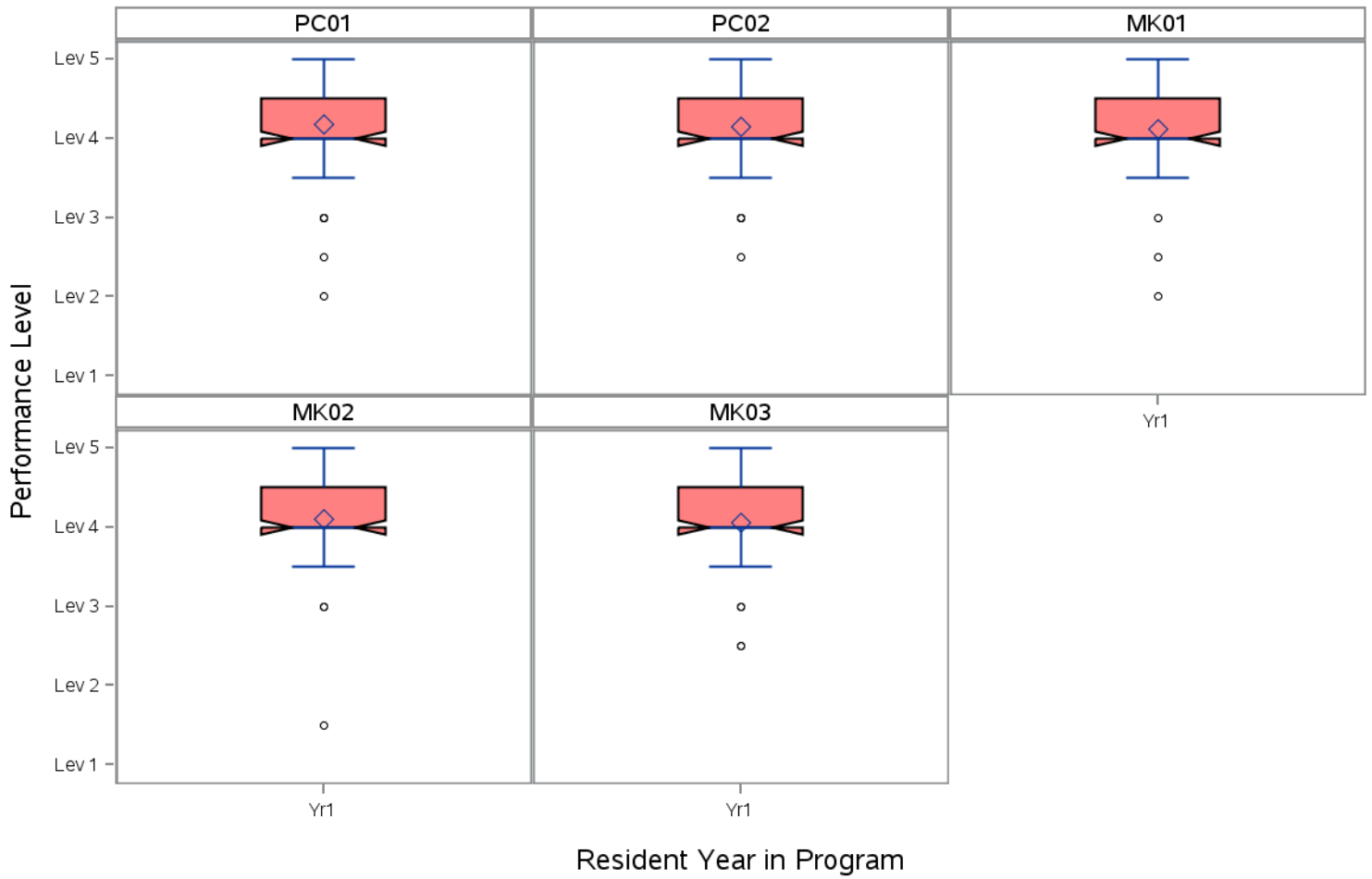


Table 119 - Psychosomatic medicine (June 2017)



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Table 119 - Psychosomatic medicine (June 2017)

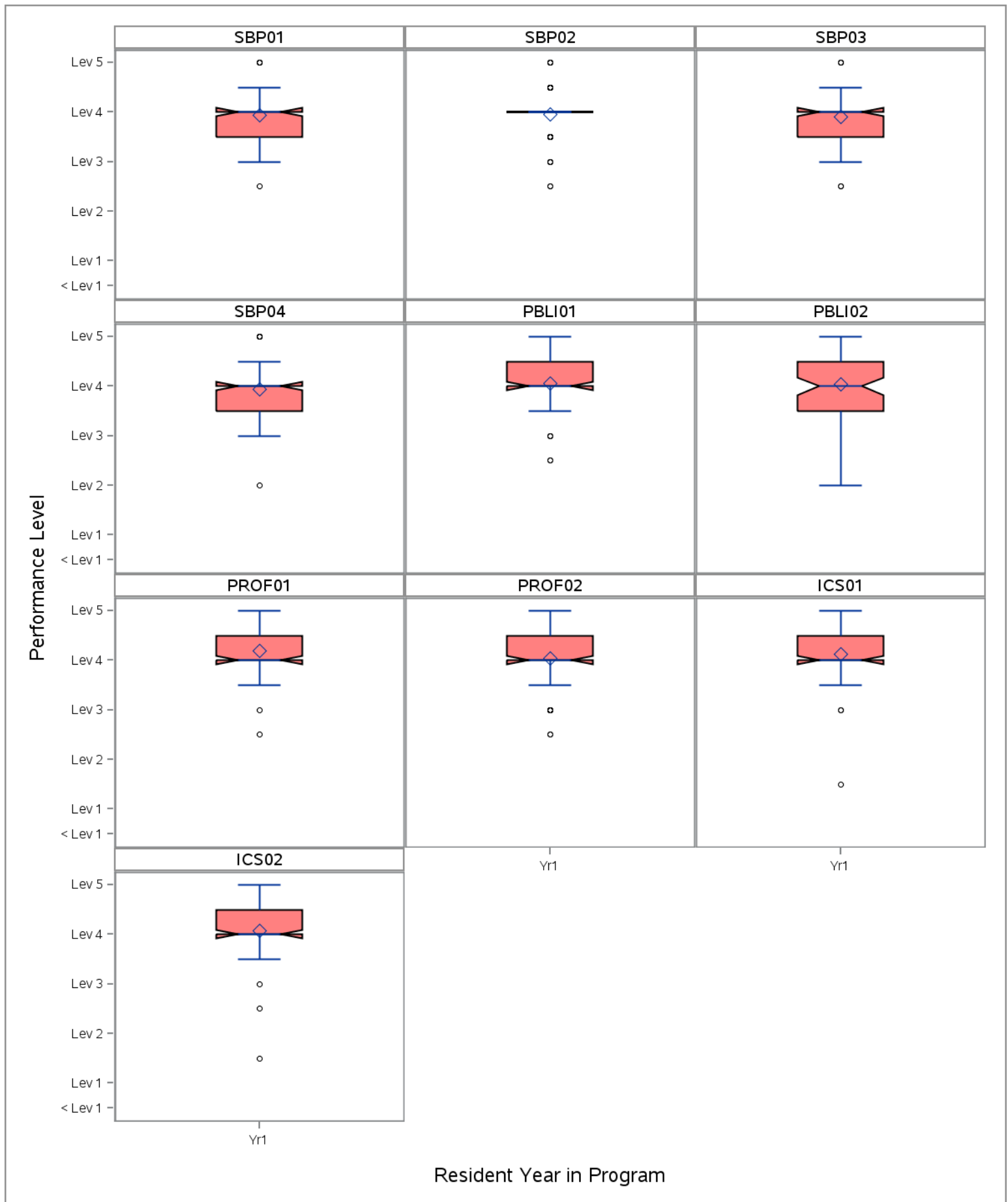
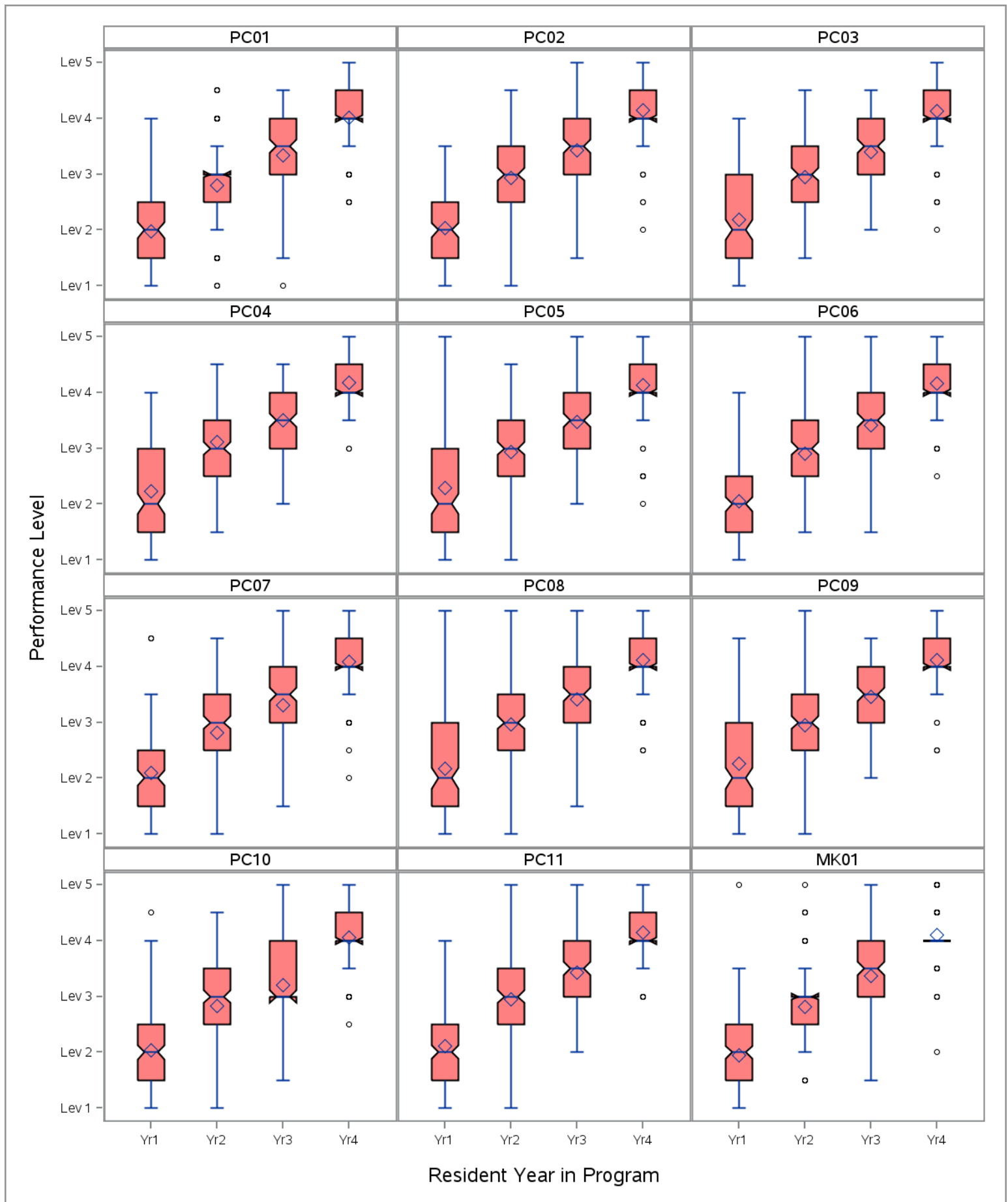
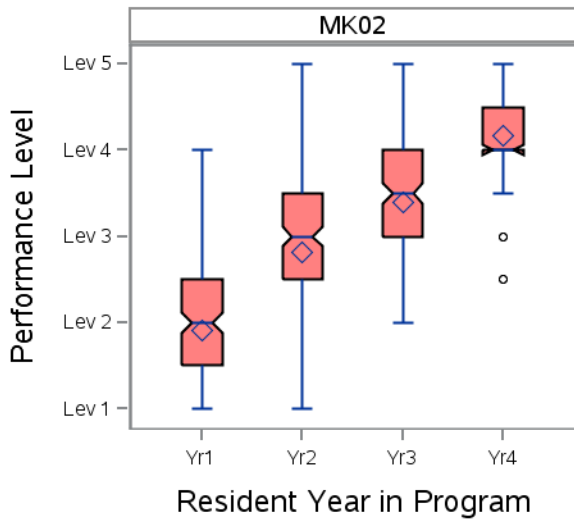


Table 120 - Radiation oncology (June 2017)



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Table 120 - Radiation oncology (June 2017)



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Table 120 - Radiation oncology (June 2017)

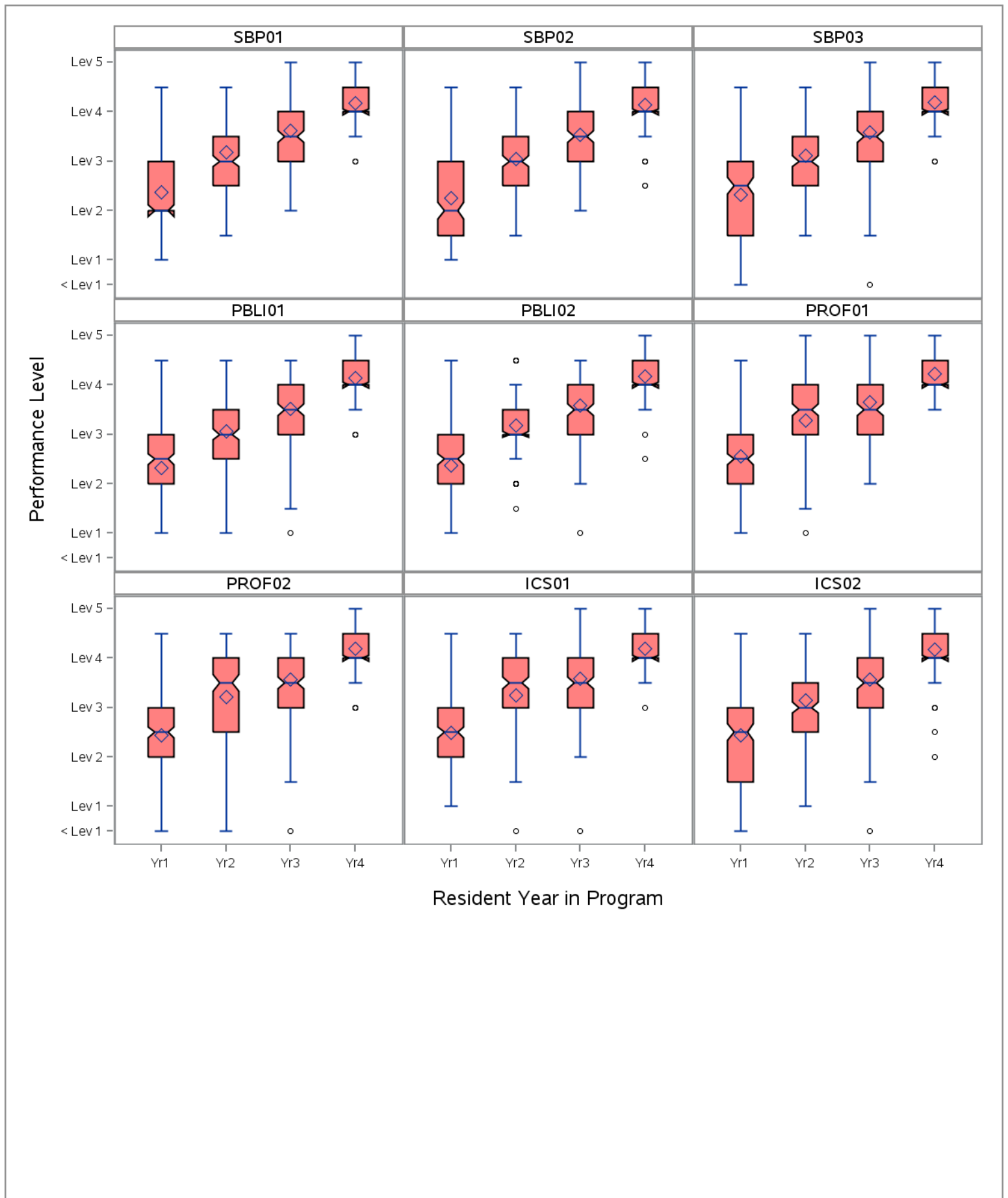
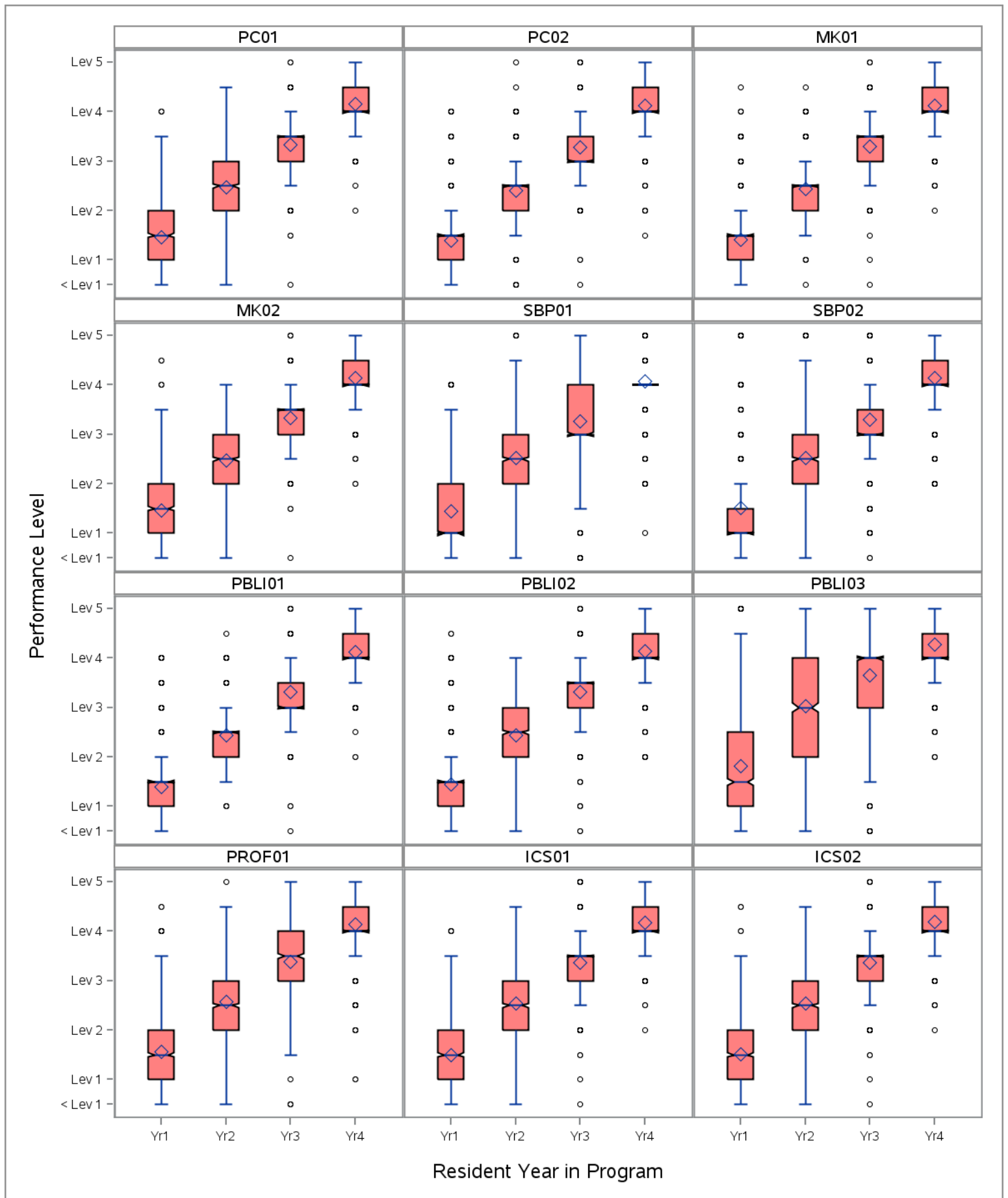
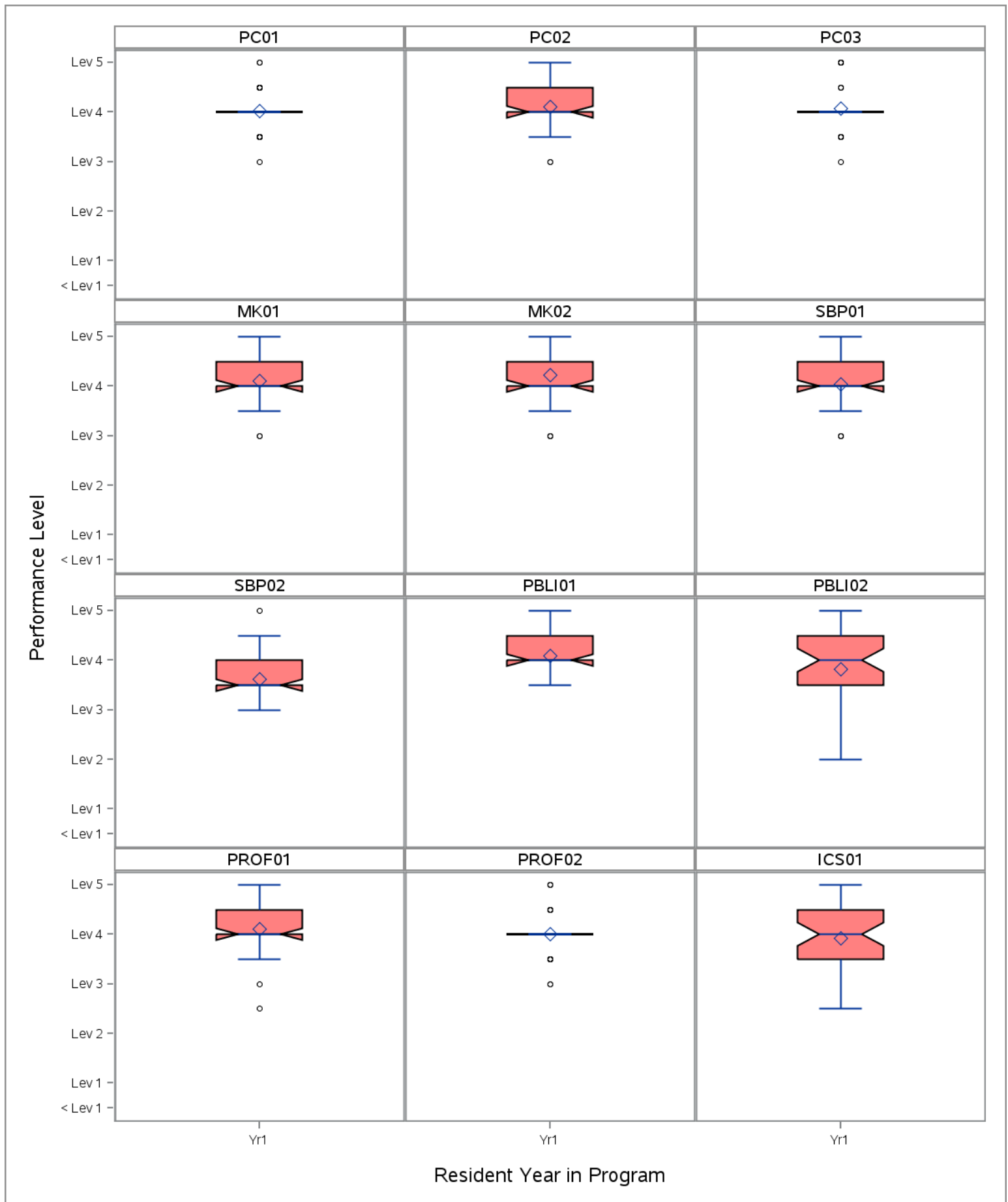


Table 121 - Radiology (June 2017)



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Table 122 - Abdominal radiology (June 2017)



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Table 122 - Abdominal radiology (June 2017)

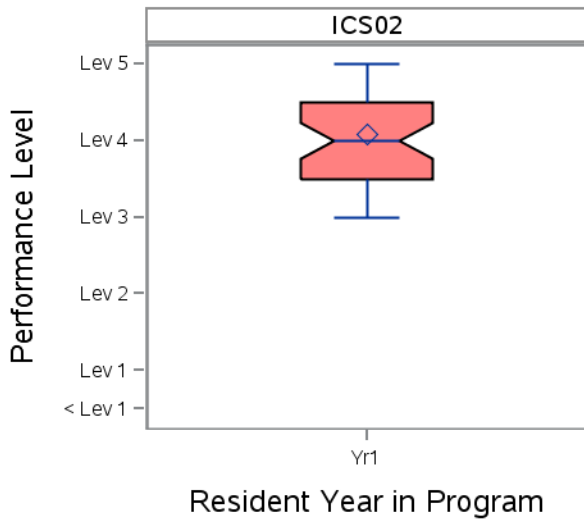
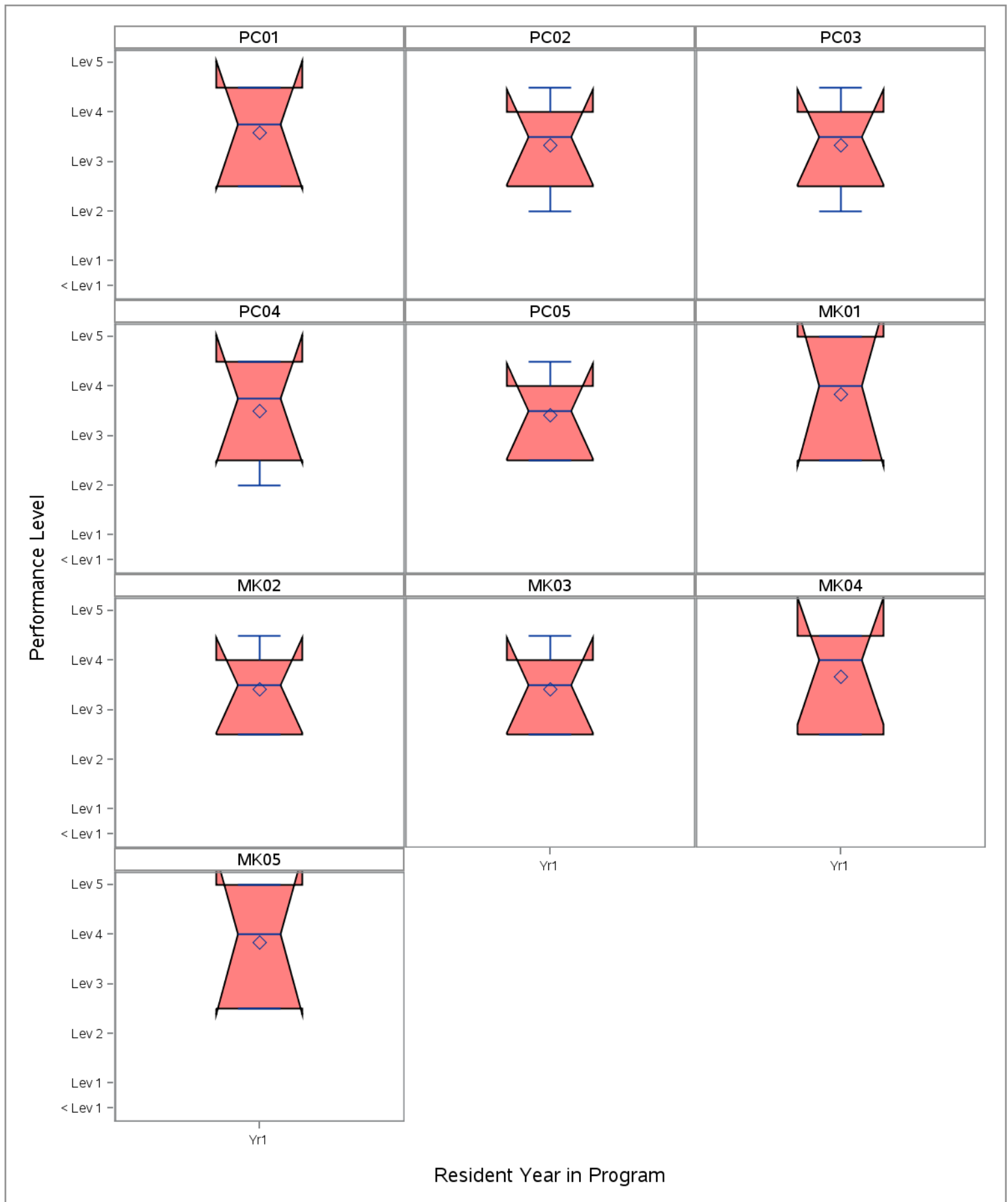


Table 123 - Endovascular surgical neuroradiology (June 2017)



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Table 123 - Endovascular surgical neuroradiology (June 2017)

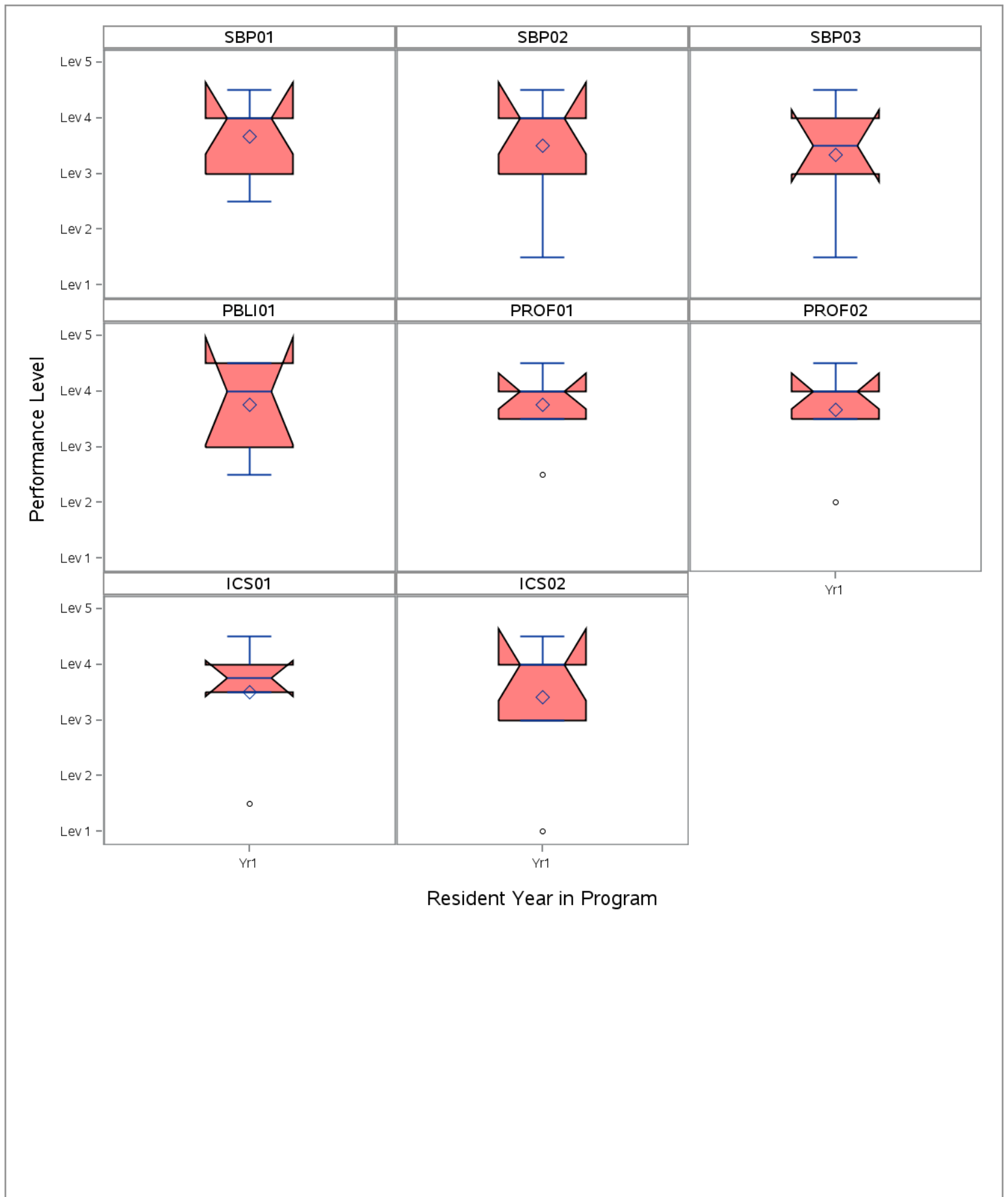
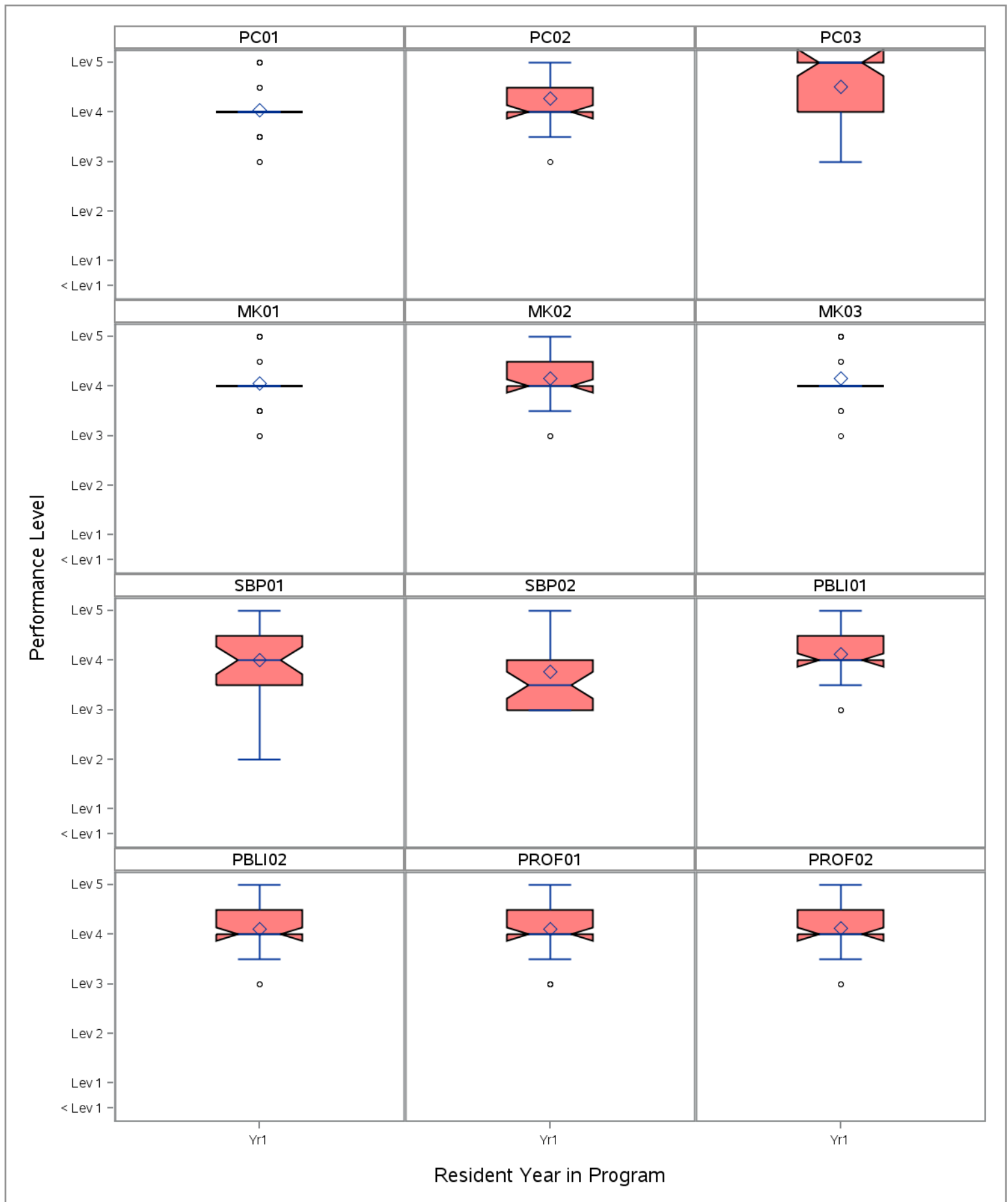


Table 124 - Musculoskeletal radiology (June 2017)



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Table 124 - Musculoskeletal radiology (June 2017)

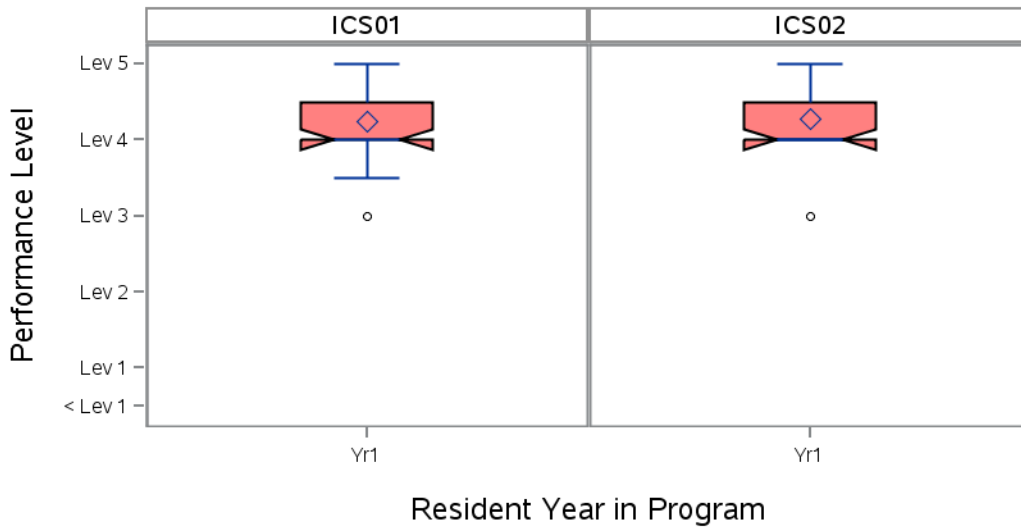
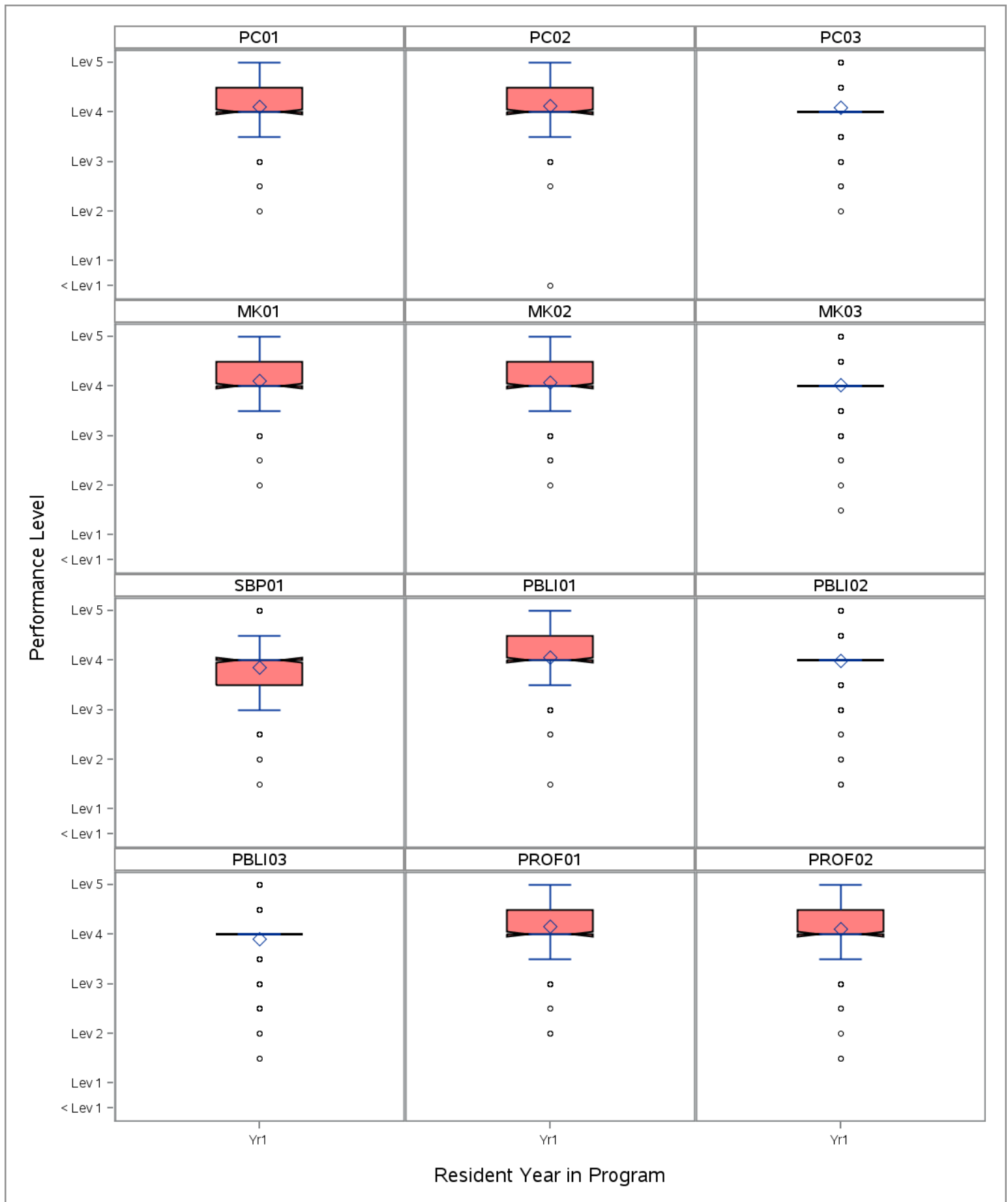


Table 125 - Neuroradiology (June 2017)



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Table 125 - Neuroradiology (June 2017)

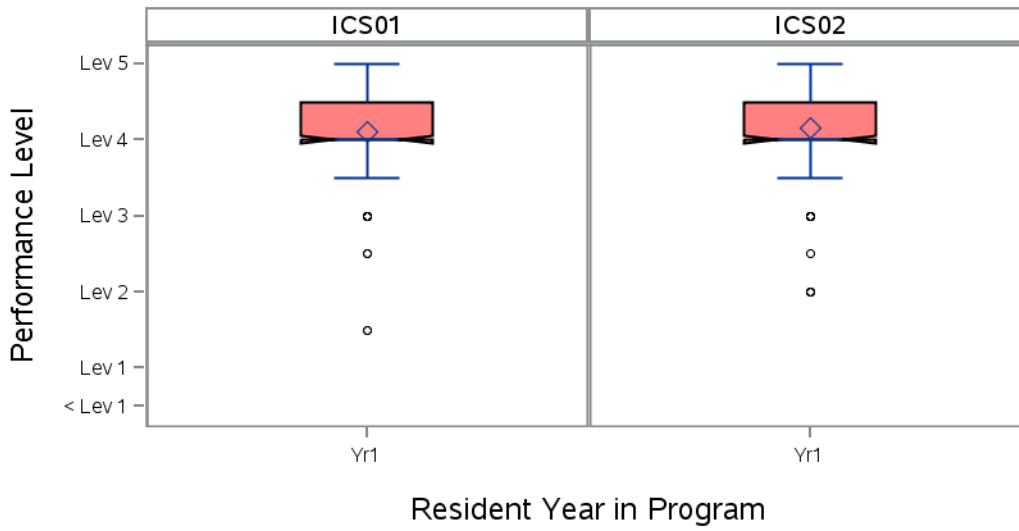
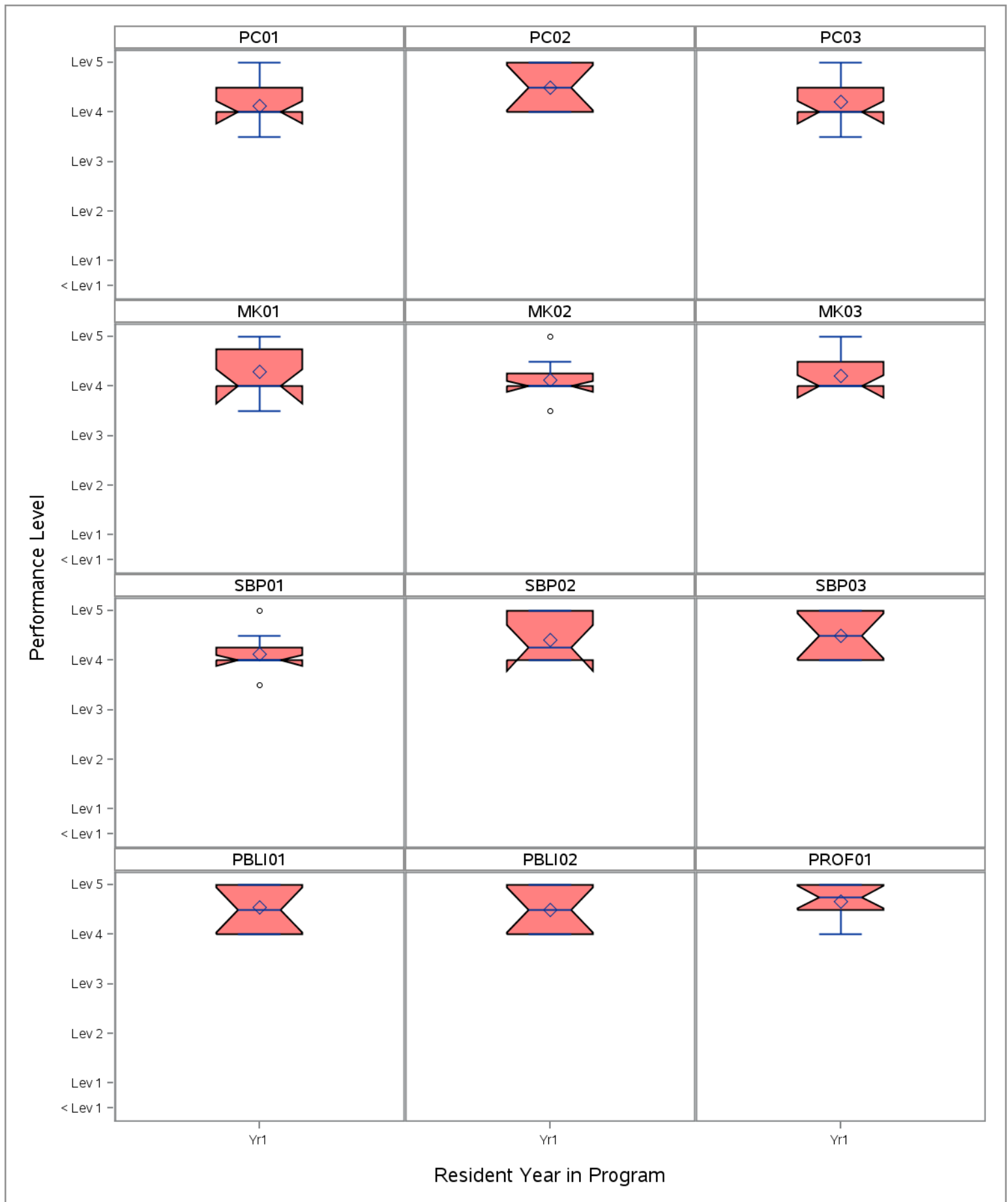


Table 126 - Nuclear radiology (June 2017)



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Table 126 - Nuclear radiology (June 2017)

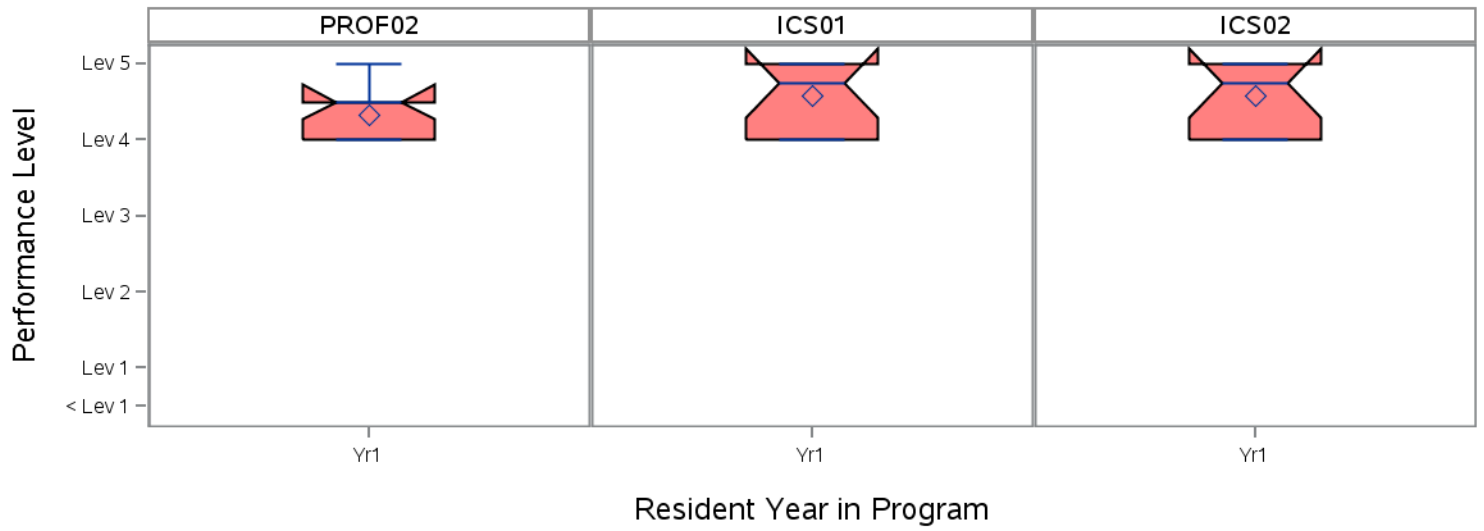
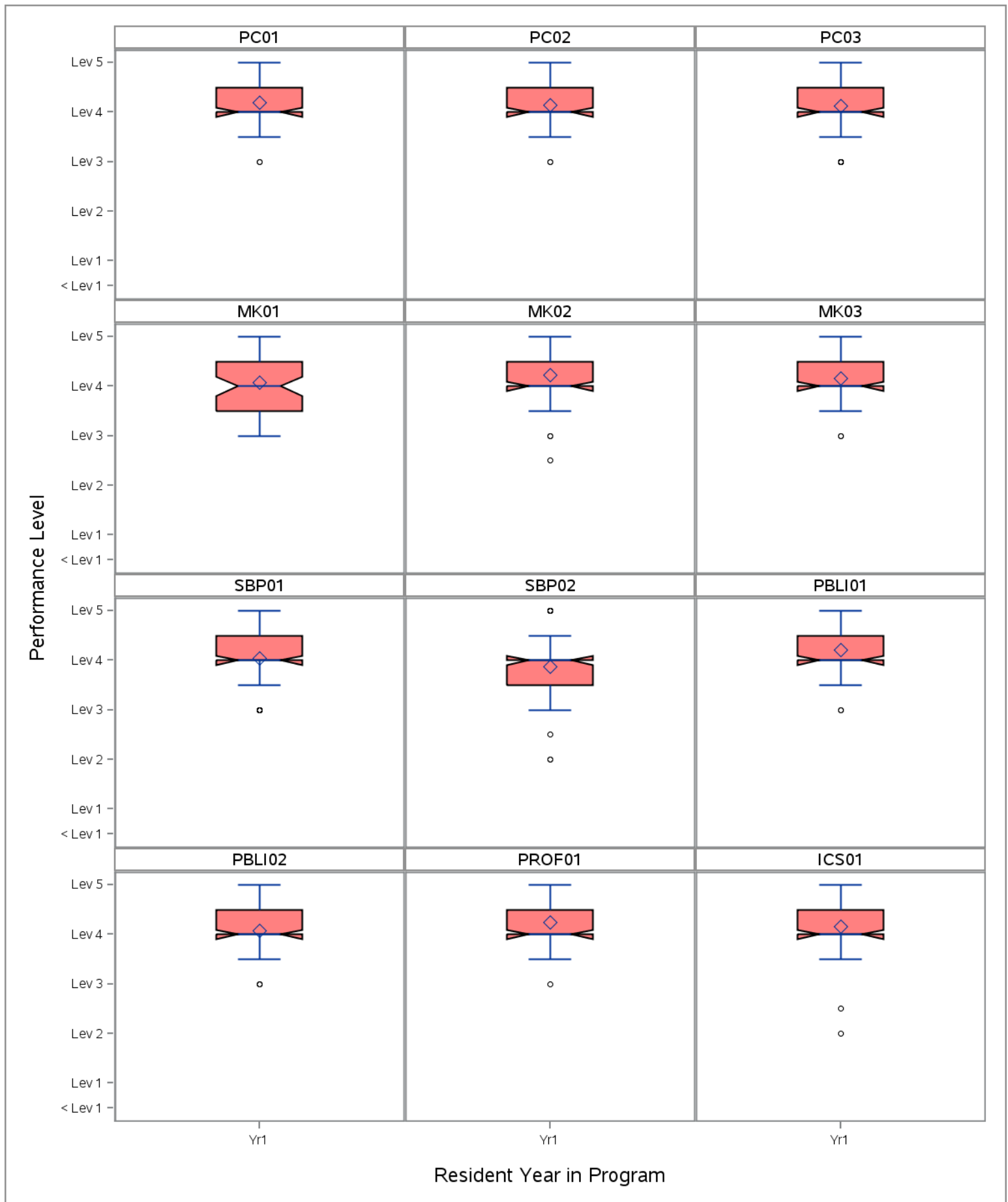


Table 127 - Pediatric radiology (June 2017)



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Table 127 - Pediatric radiology (June 2017)

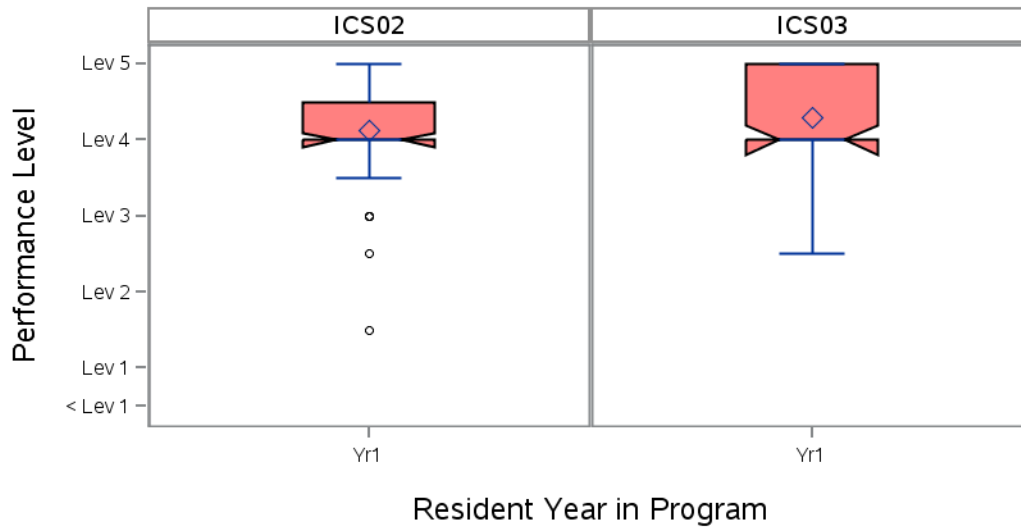
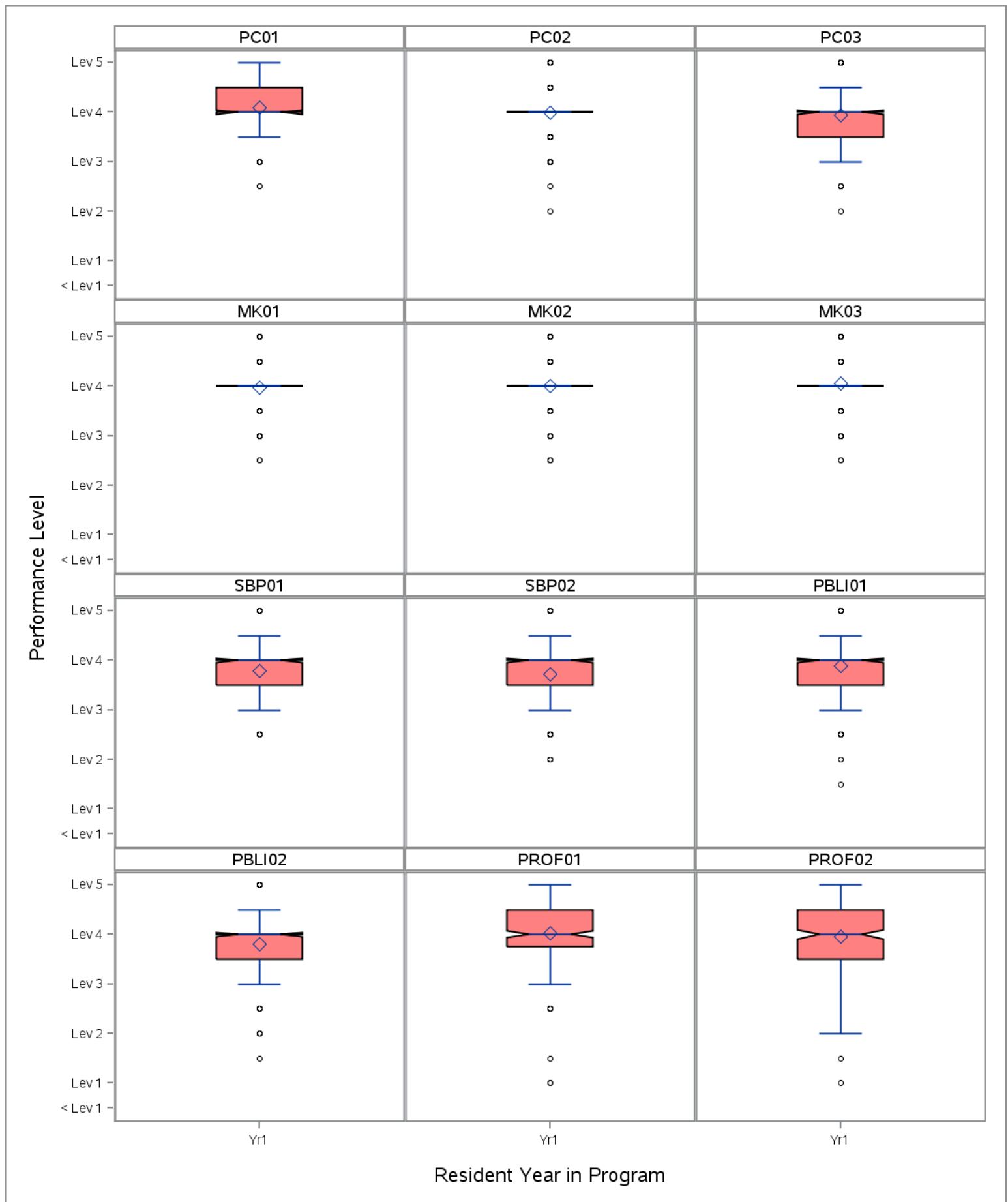


Table 128 - Vascular and interventional radiology (June 2017)



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Table 128 - Vascular and interventional radiology (June 2017)

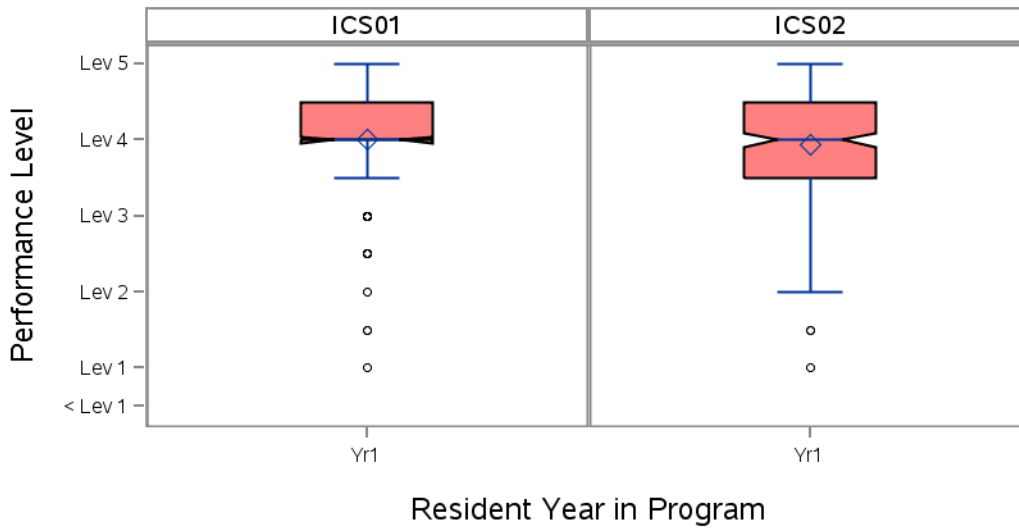
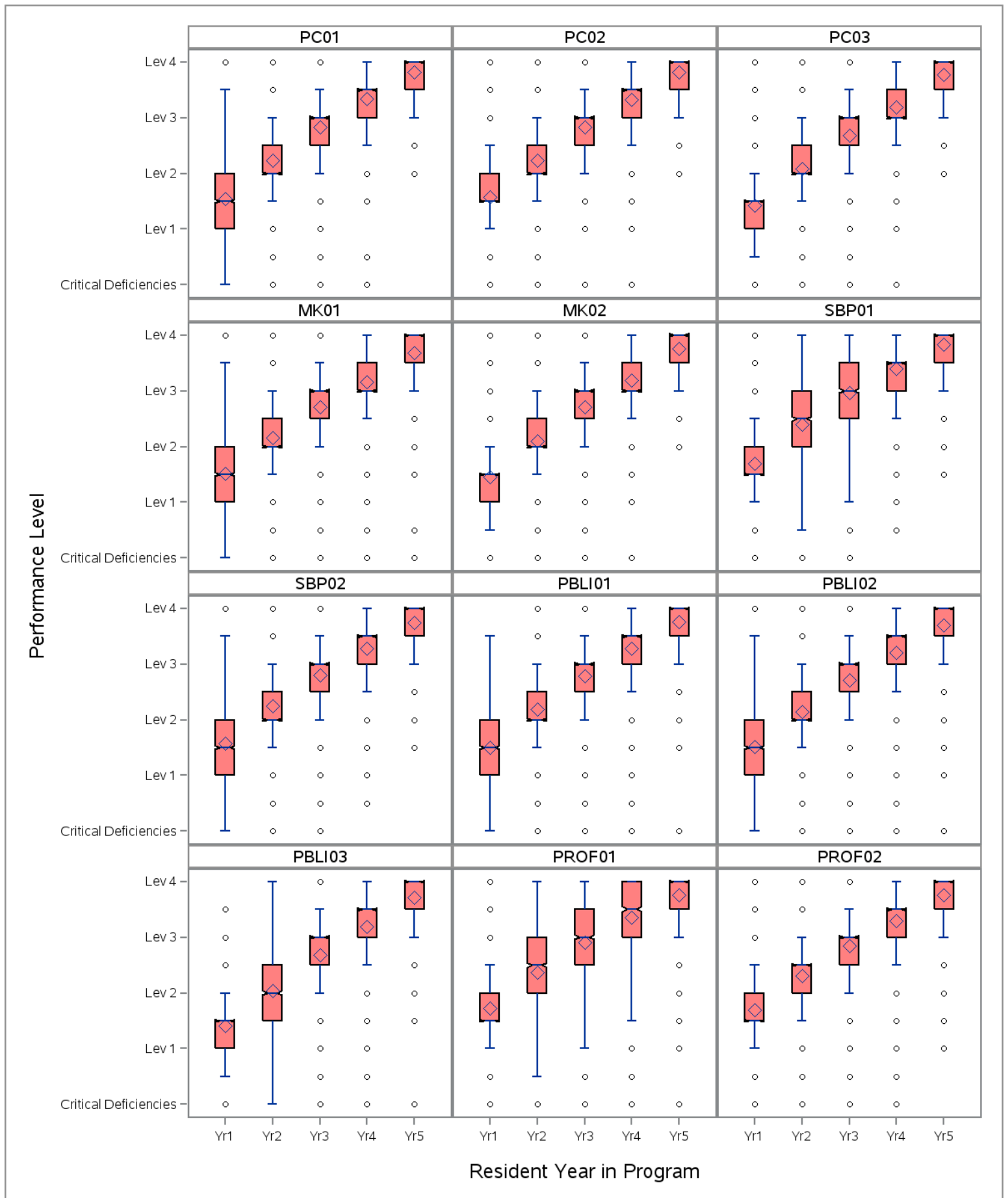


Table 129 - Surgery (June 2017)



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Table 129 - Surgery (June 2017)

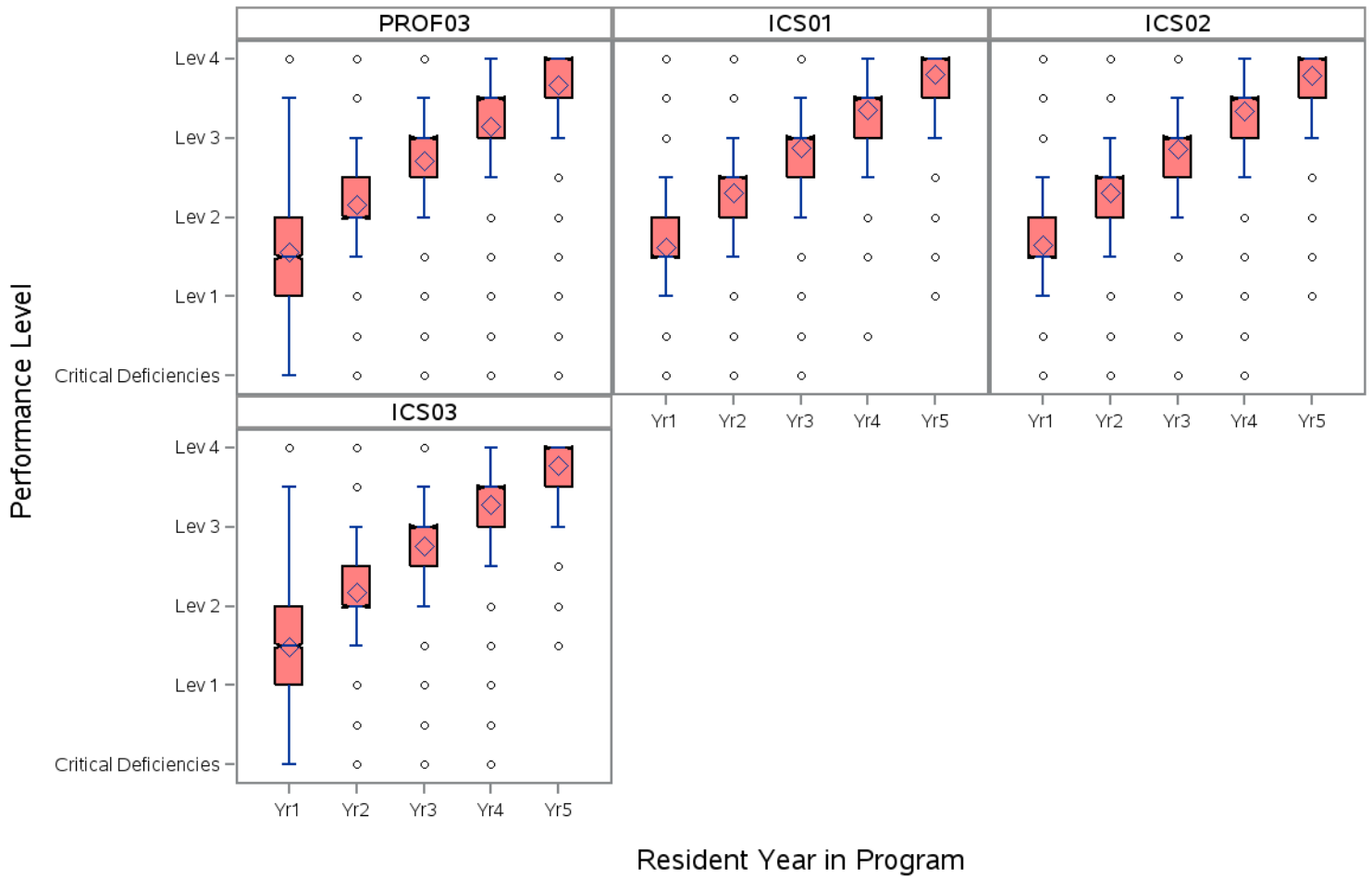
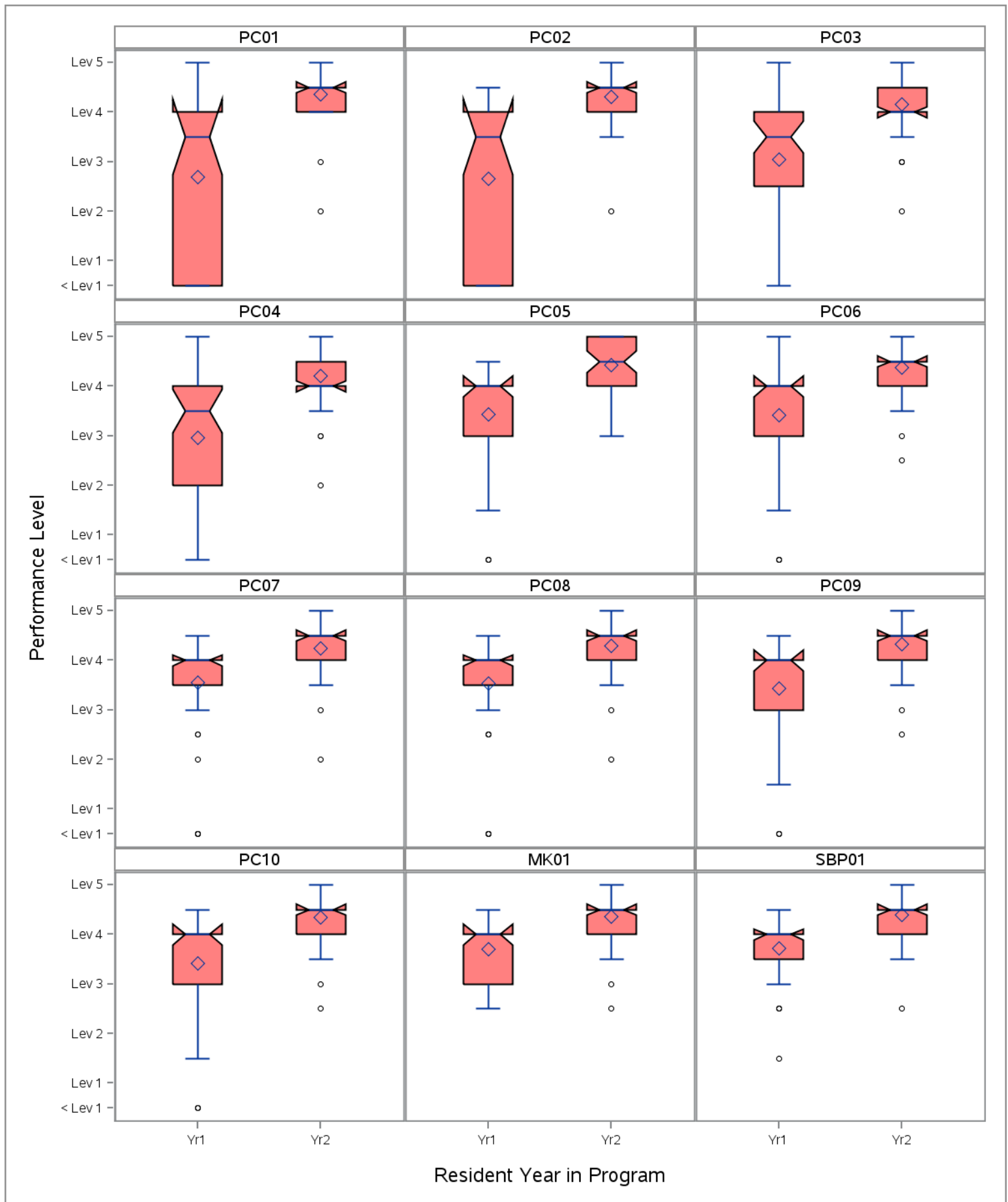


Table 130 - Complex general surgical oncology (June 2017)



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Table 130 - Complex general surgical oncology (June 2017)

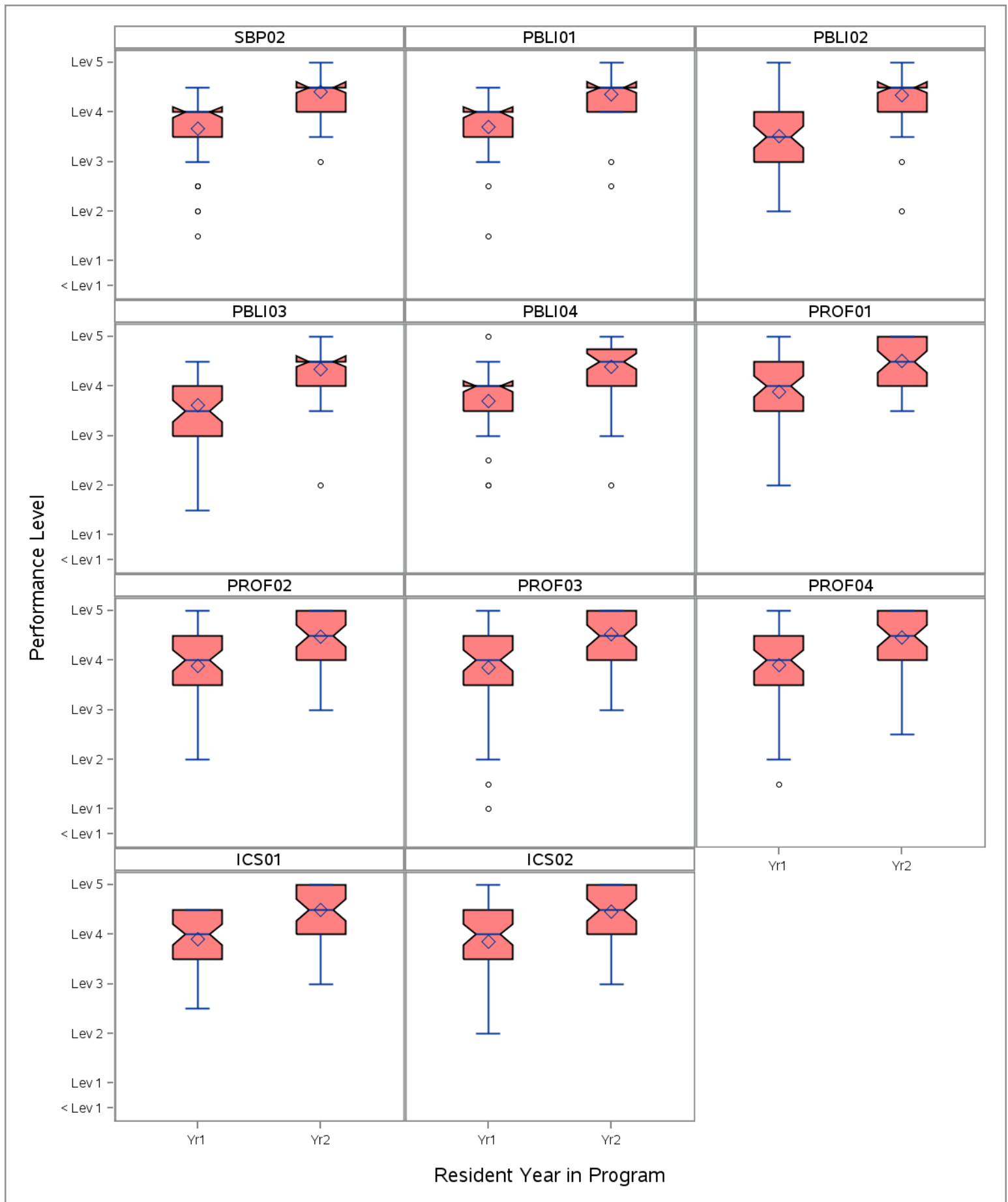
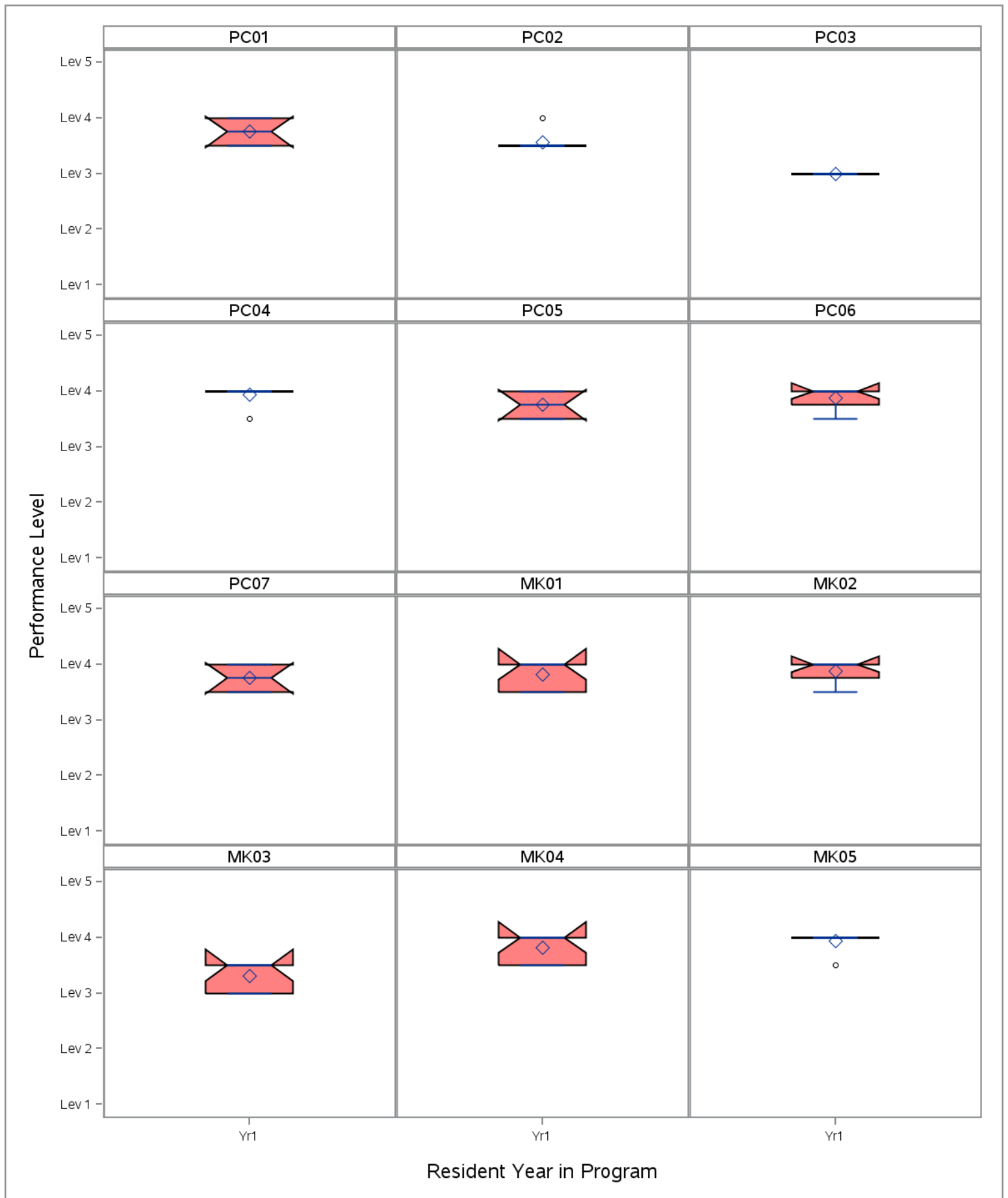


Table 131 - Hand surgery (June 2017)



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Table 131 - Hand surgery (June 2017)

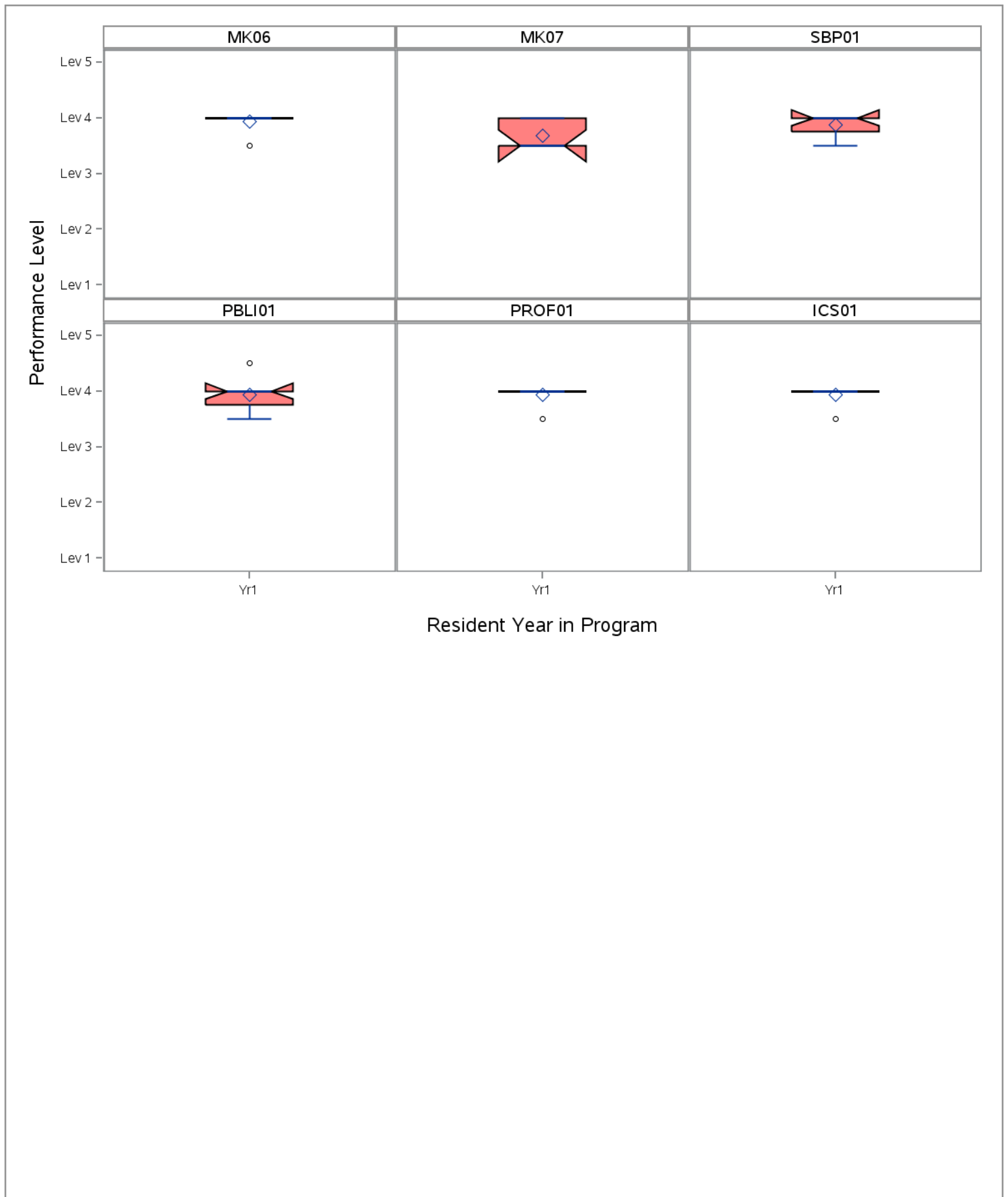
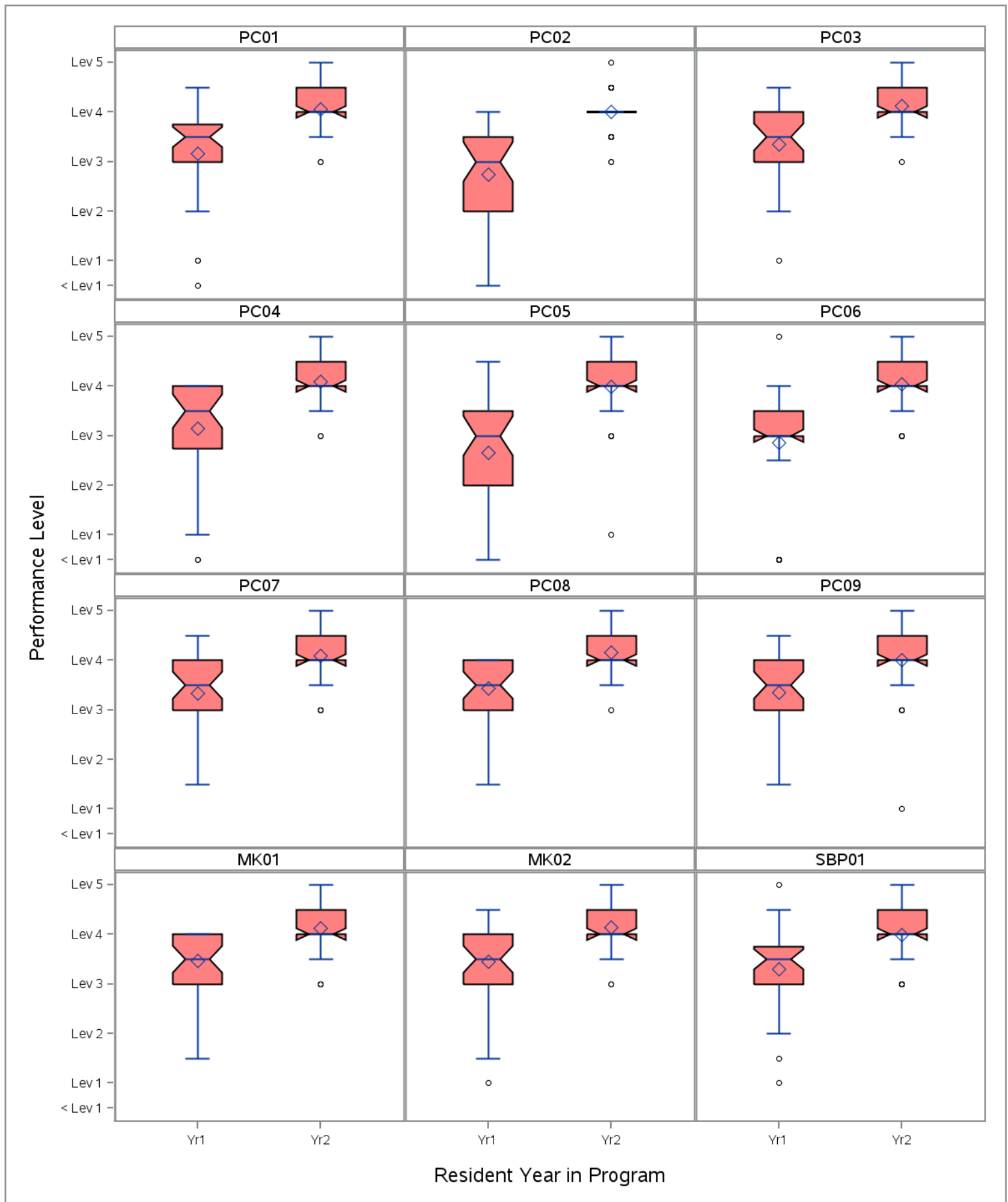


Table 132 - Pediatric surgery (June 2017)



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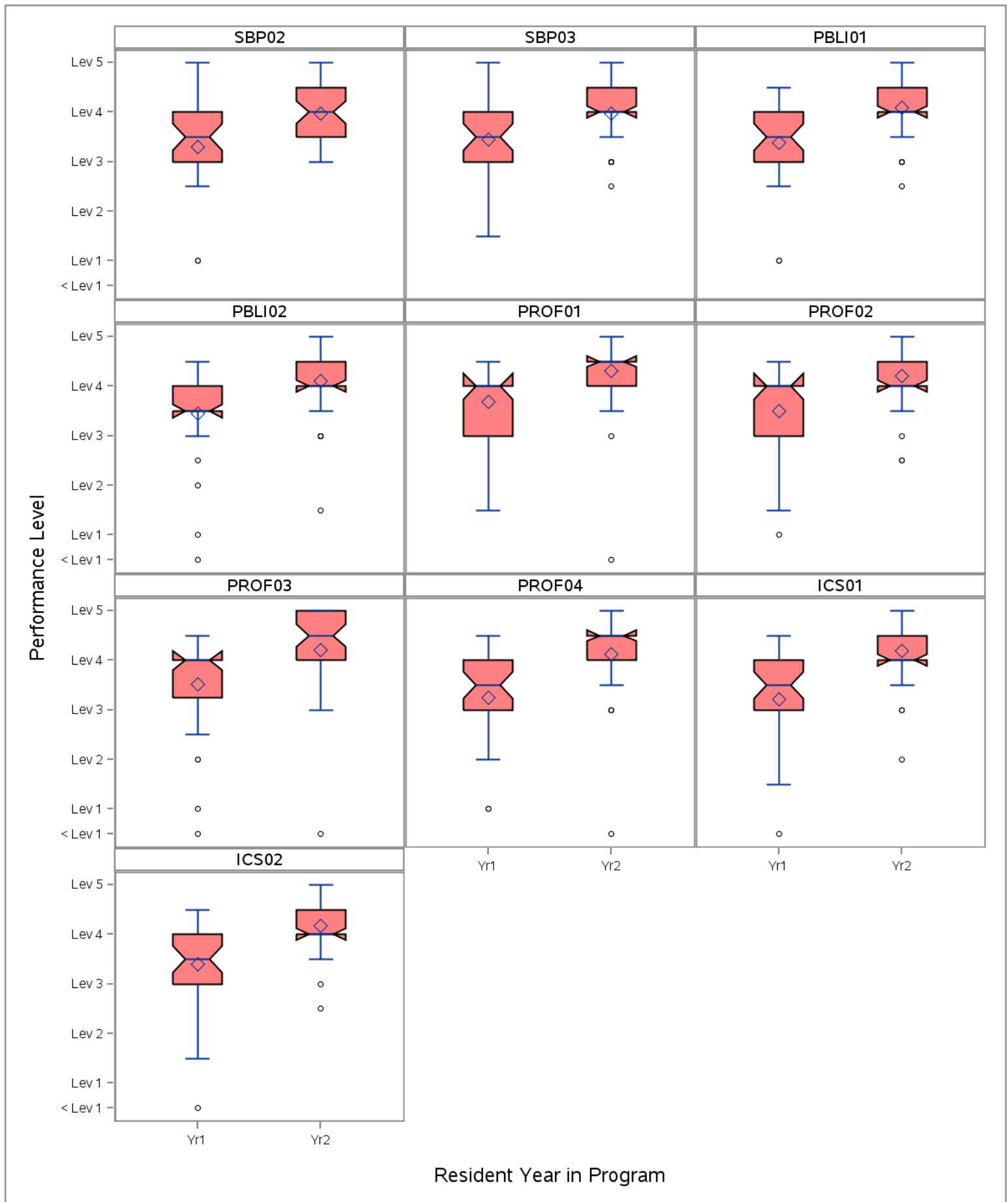
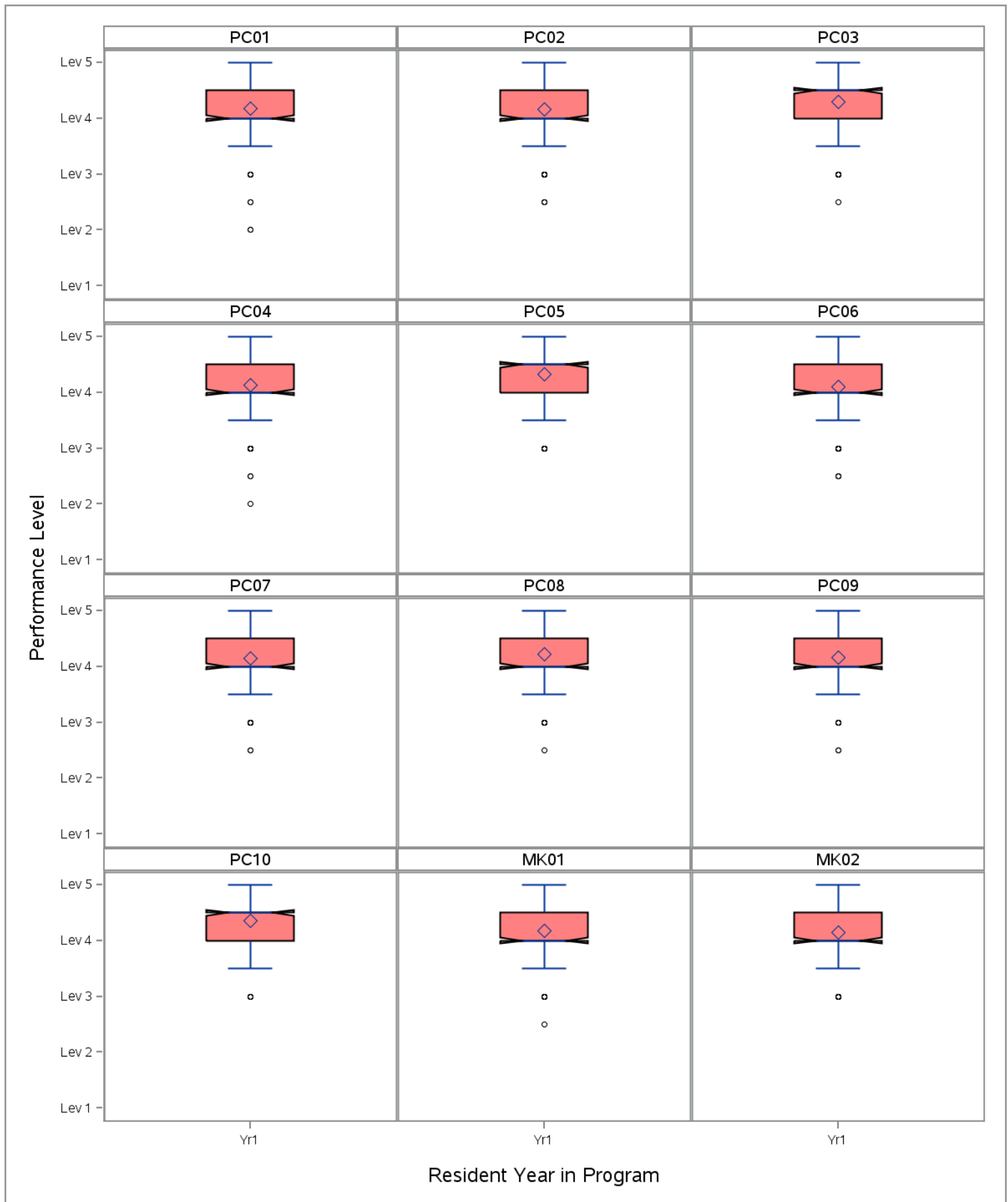
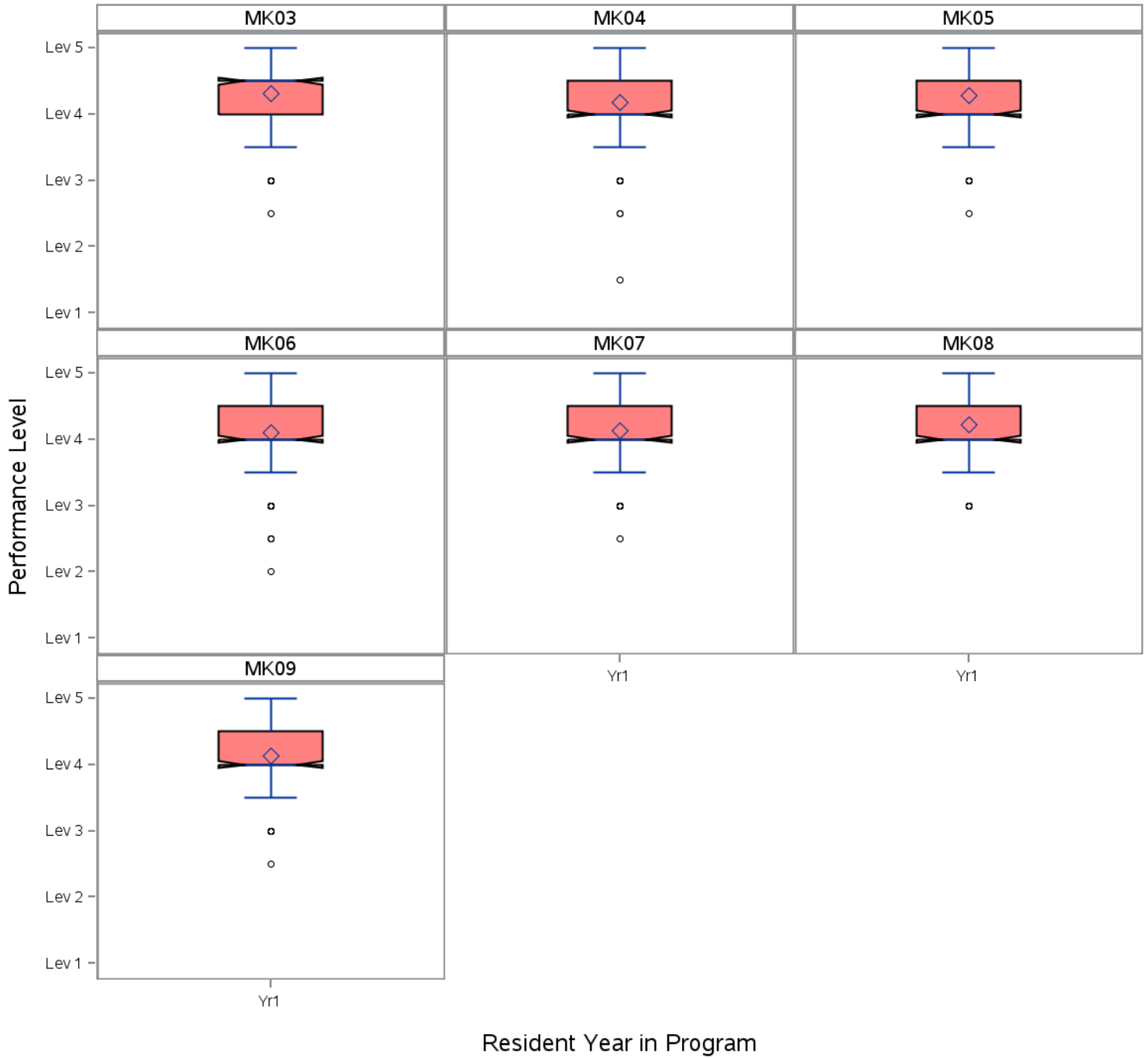


Table 133 - Surgical critical care (June 2017)



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Table 133 - Surgical critical care (June 2017)



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Table 133 - Surgical critical care (June 2017)

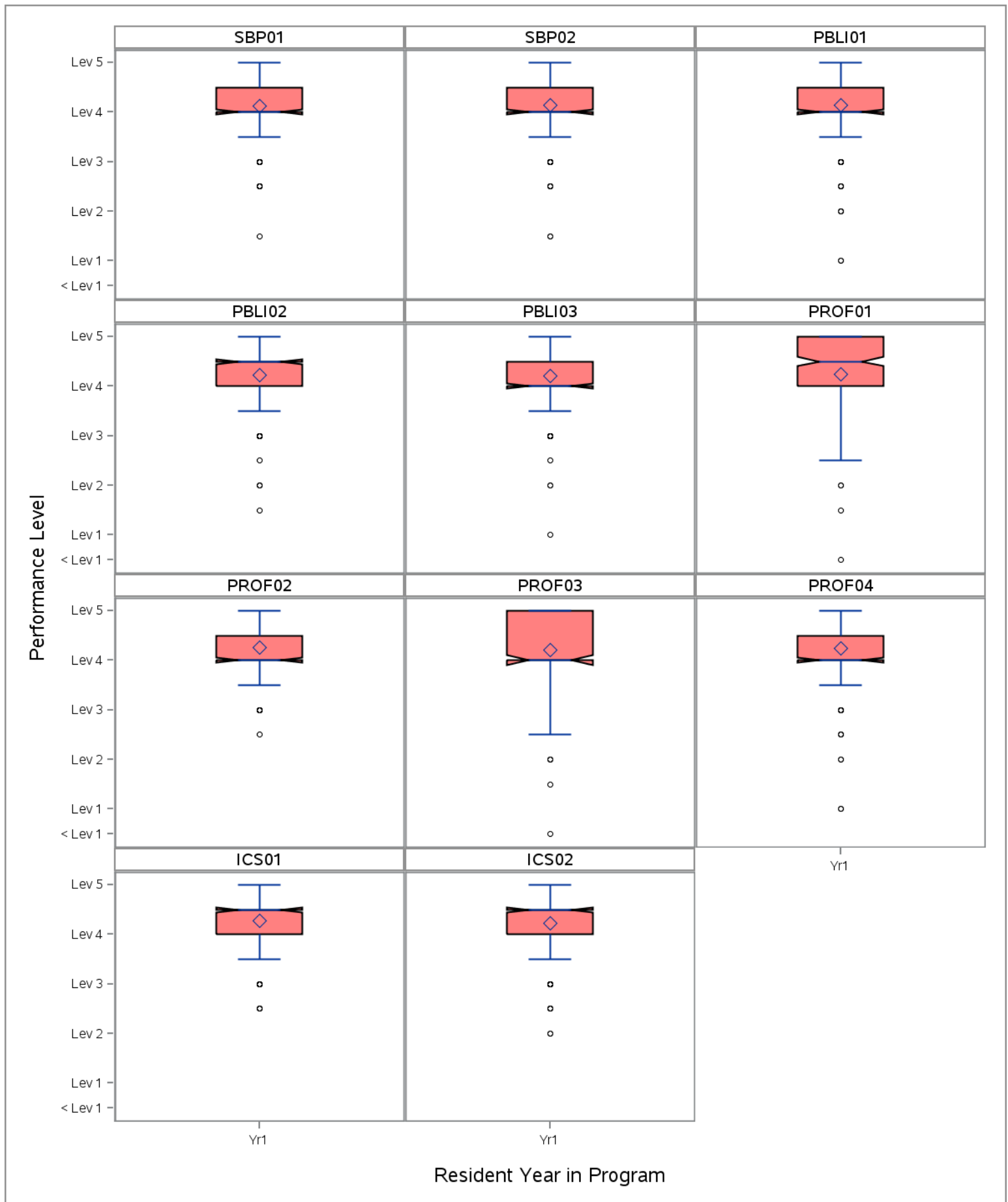
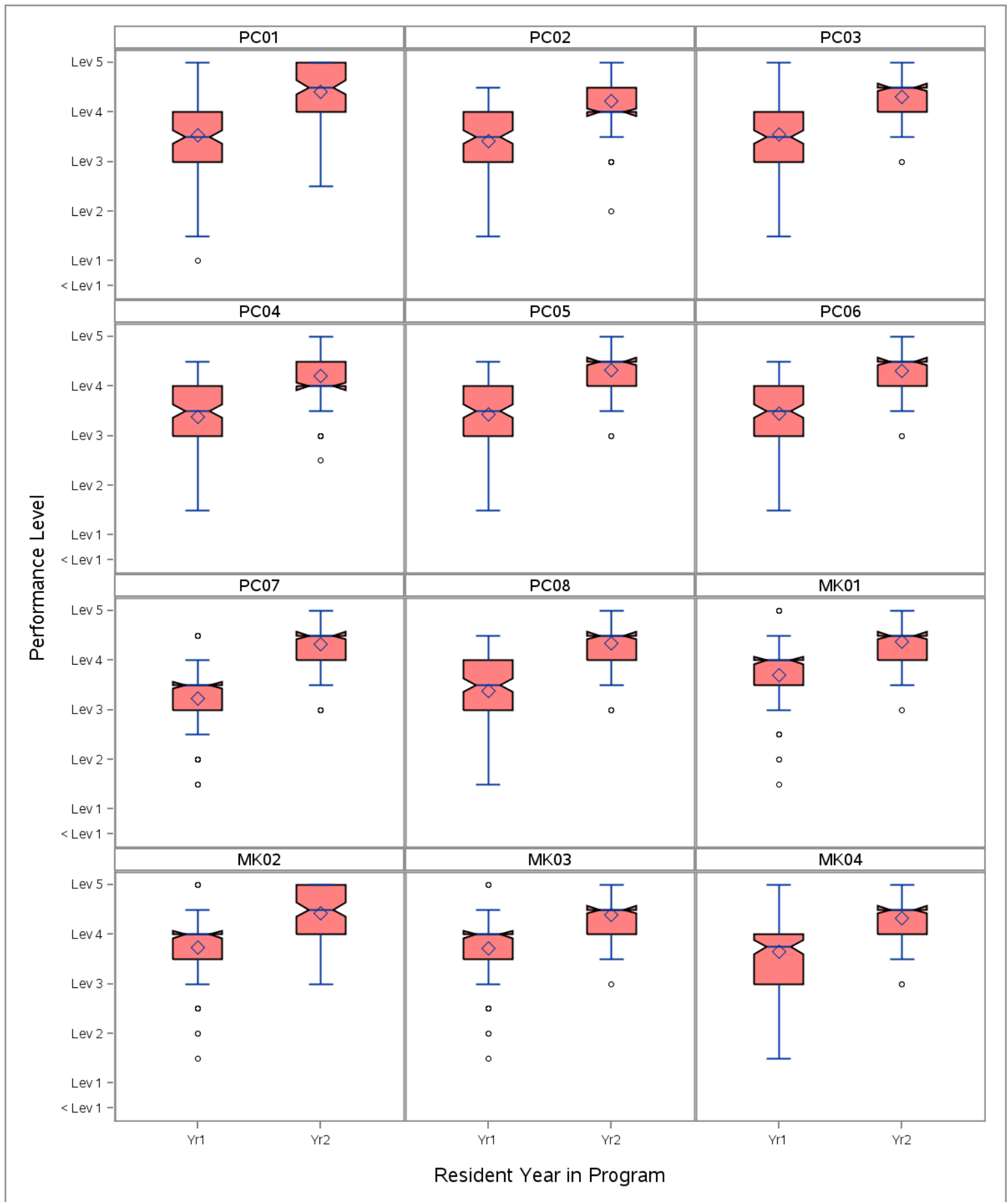
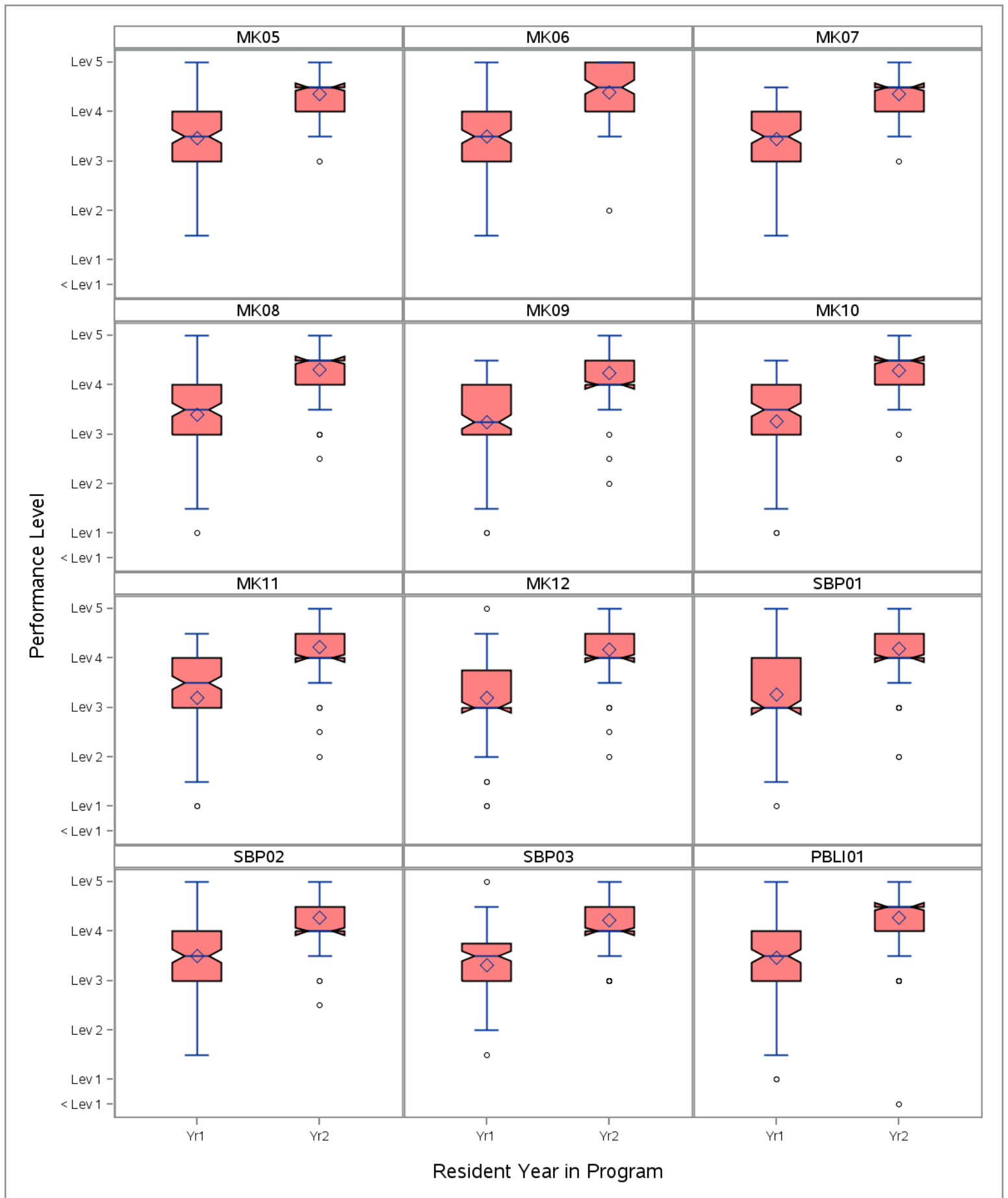


Table 134 - Vascular surgery (June 2017)



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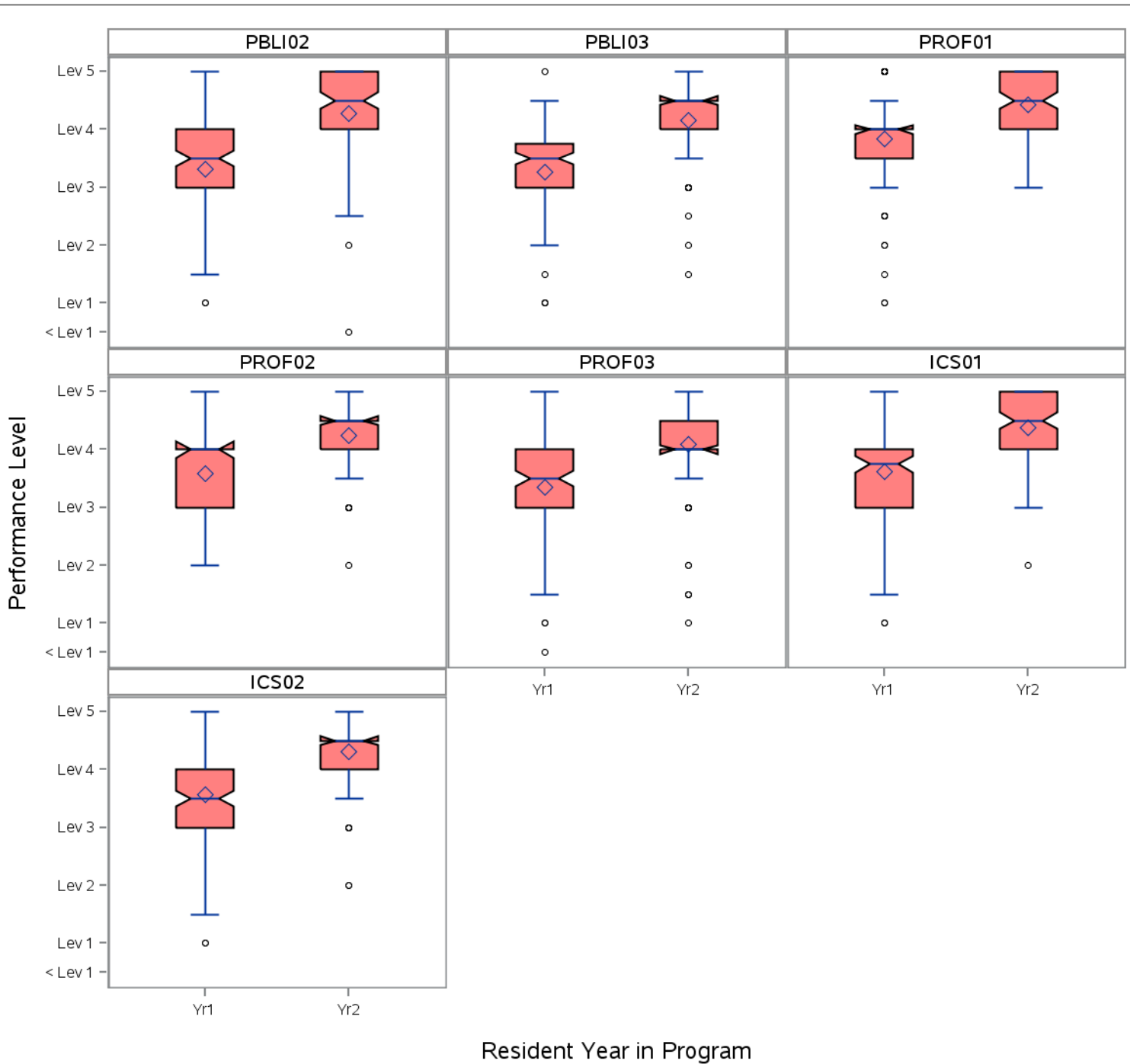
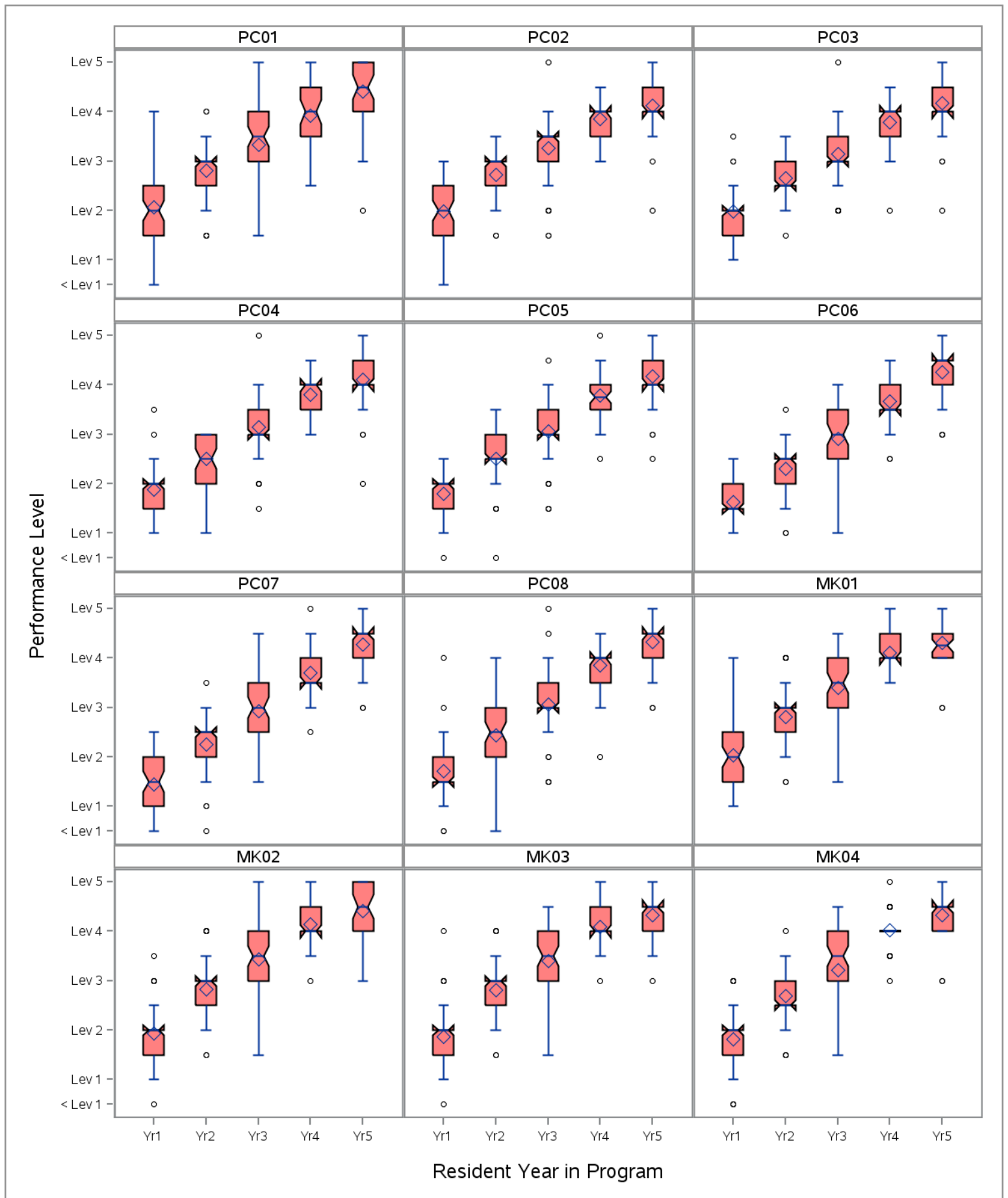
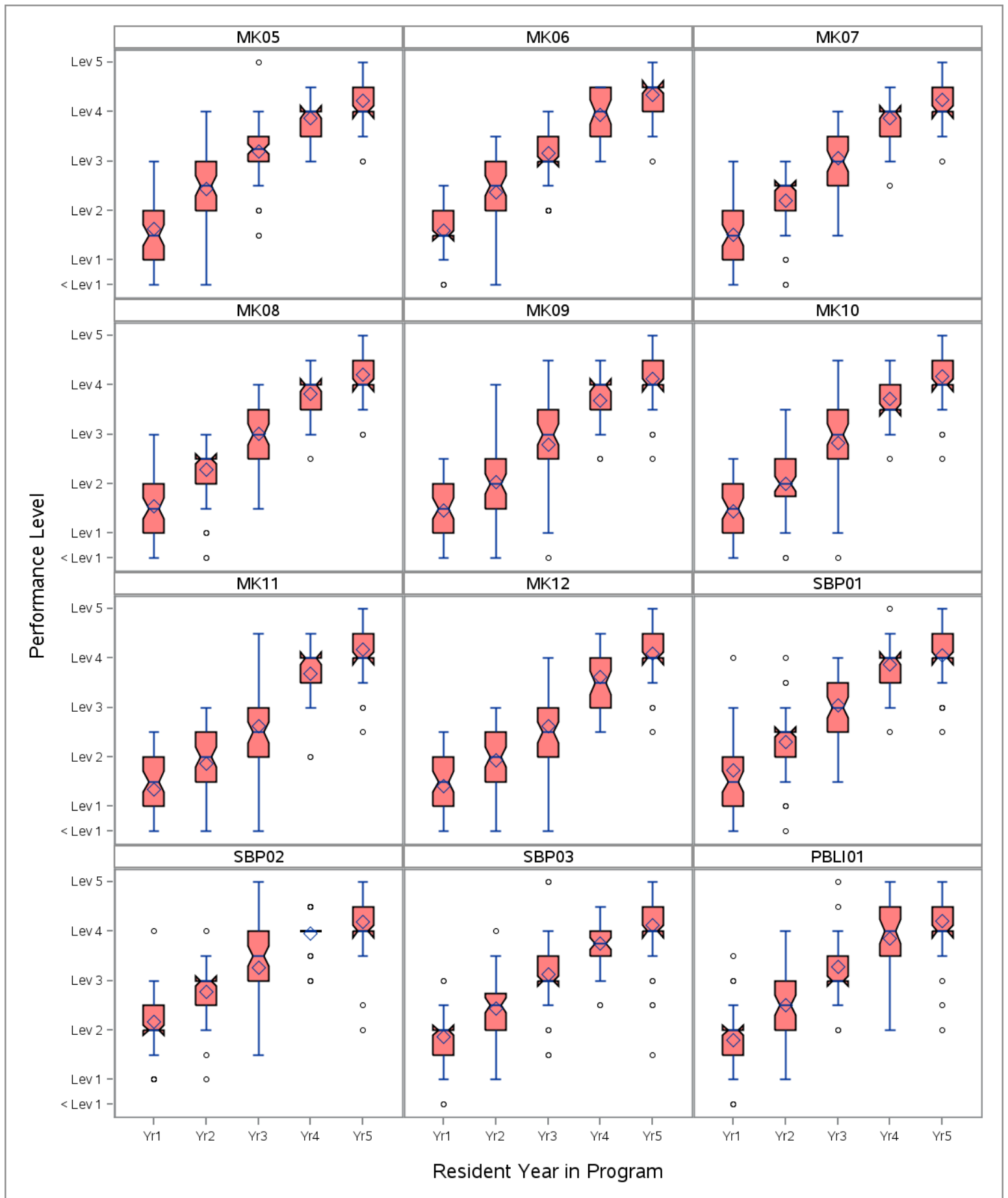


Table 135 - Vascular surgery - integrated (June 2017)



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Table 135 - Vascular surgery - integrated (June 2017)



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Table 135 - Vascular surgery - integrated (June 2017)

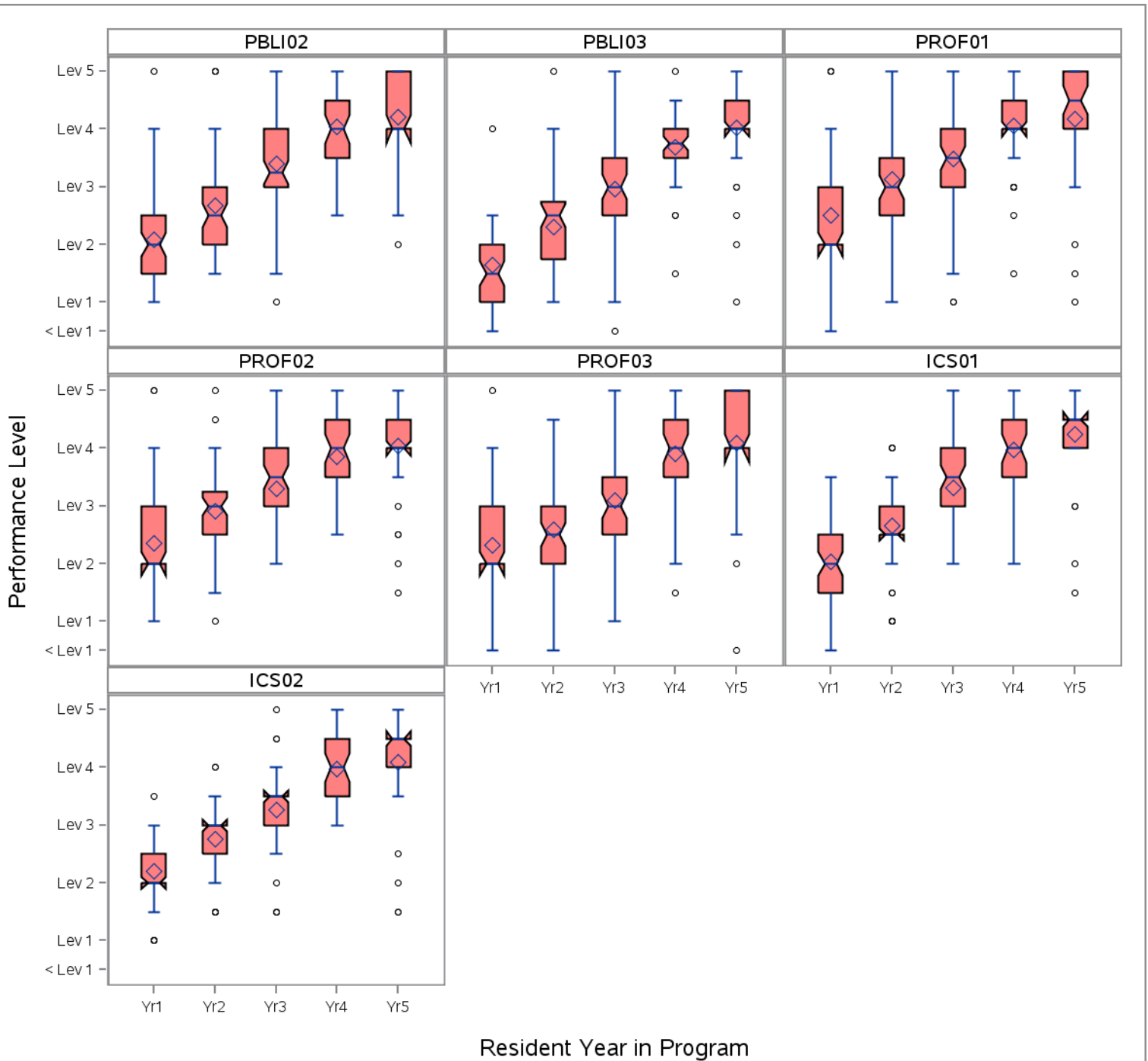
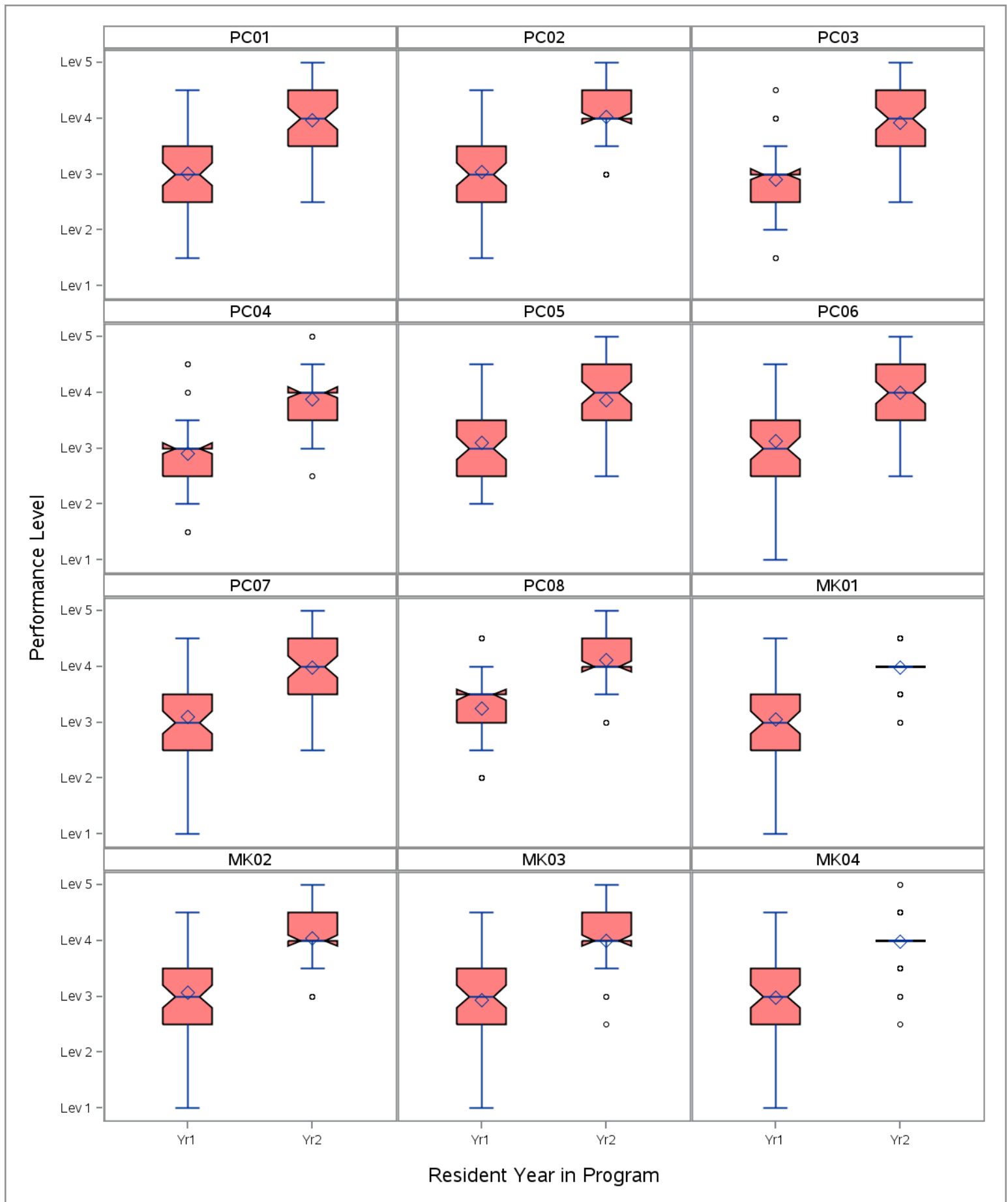
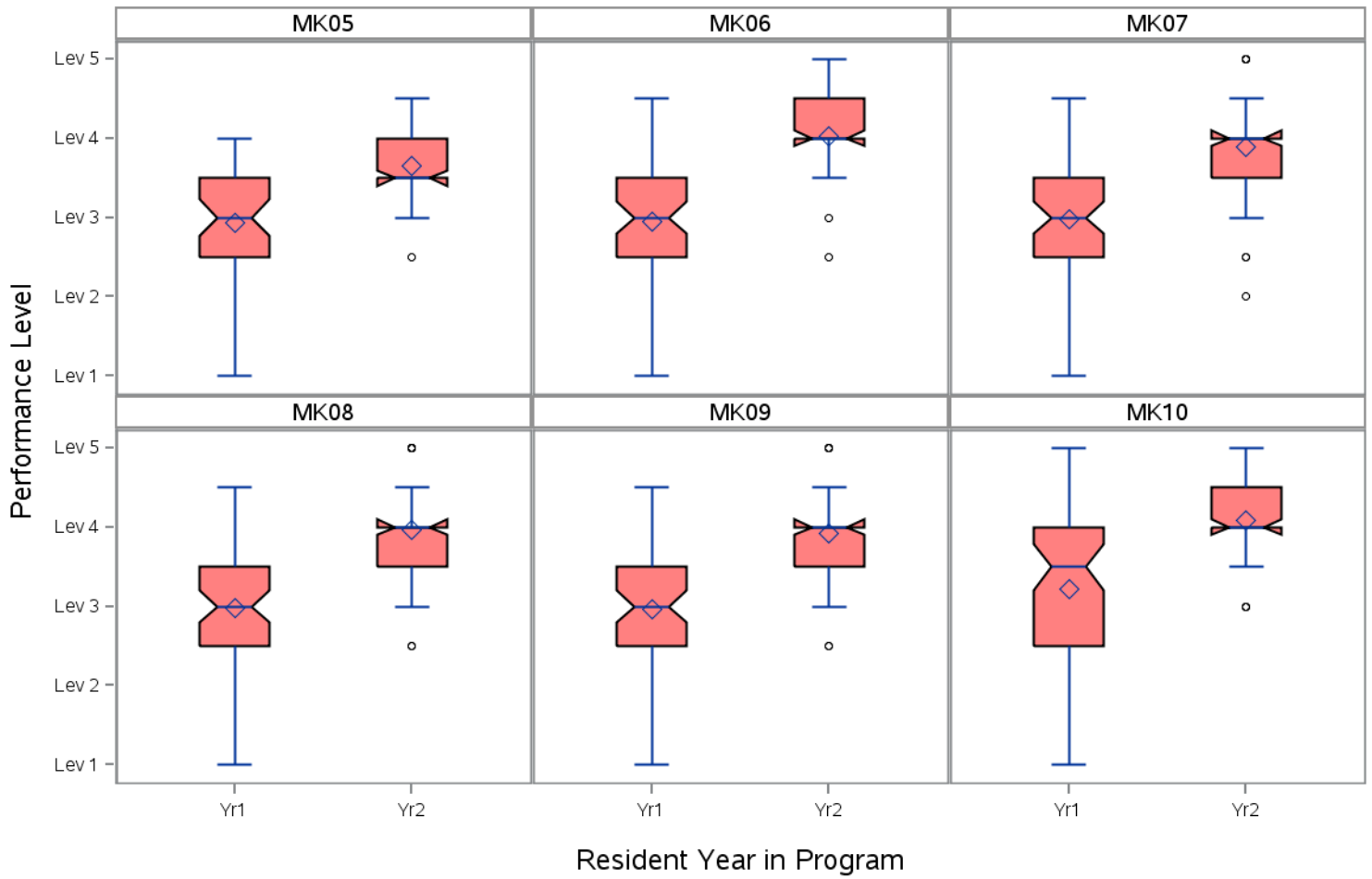


Table 136 - Thoracic surgery (June 2017)



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Table 136 - Thoracic surgery (June 2017)

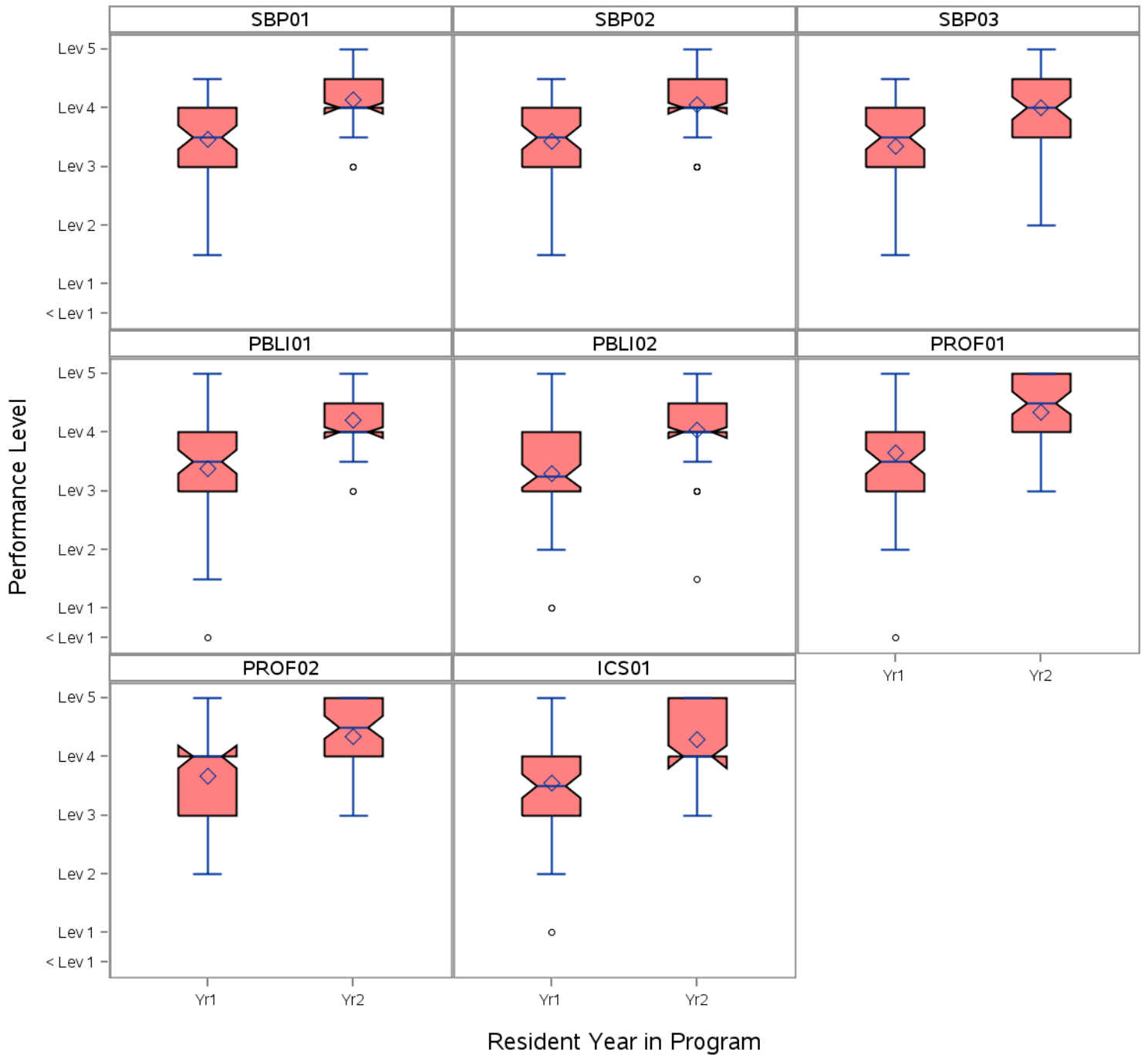


Table 137 - Congenital cardiac surgery (June 2017)

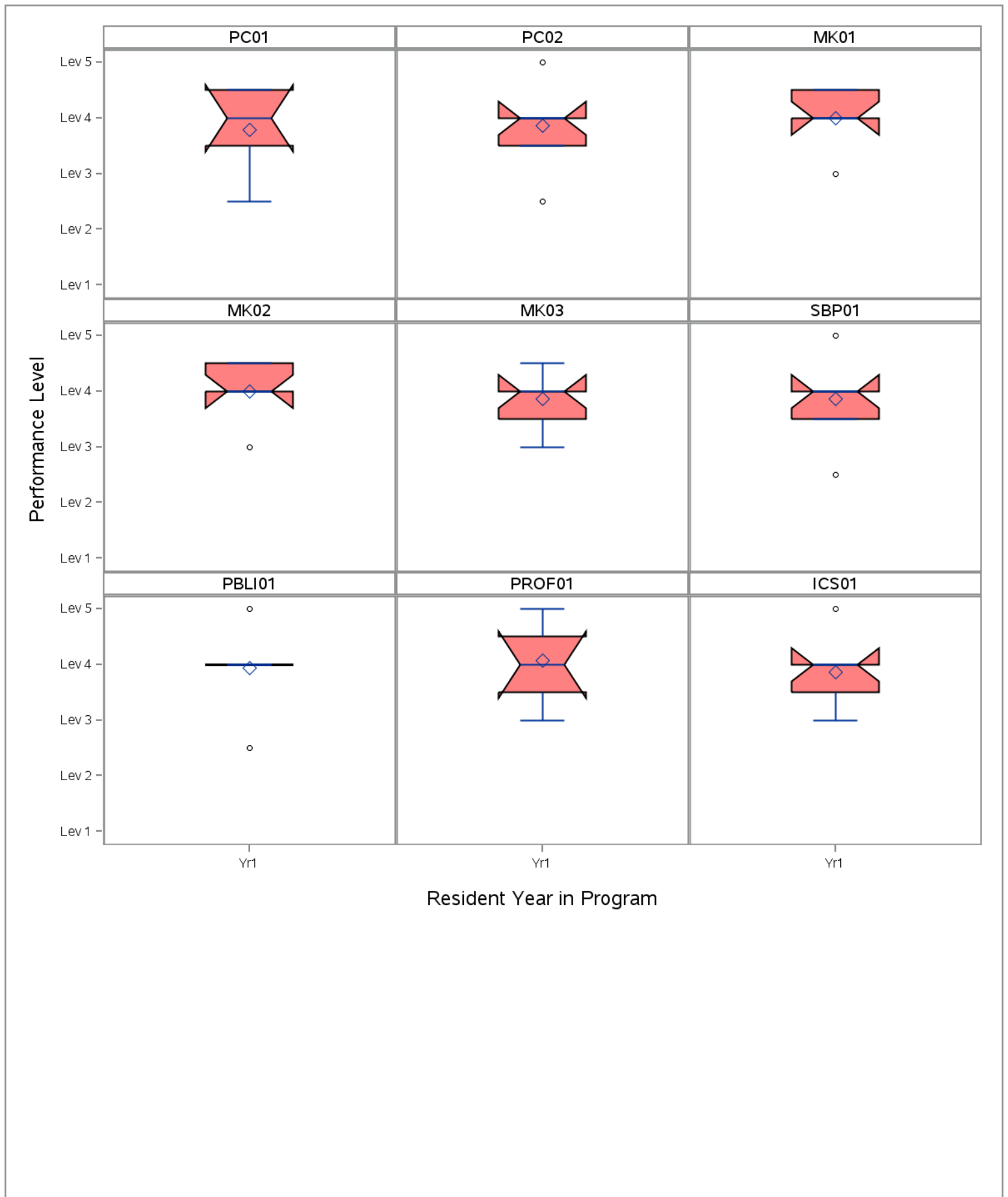
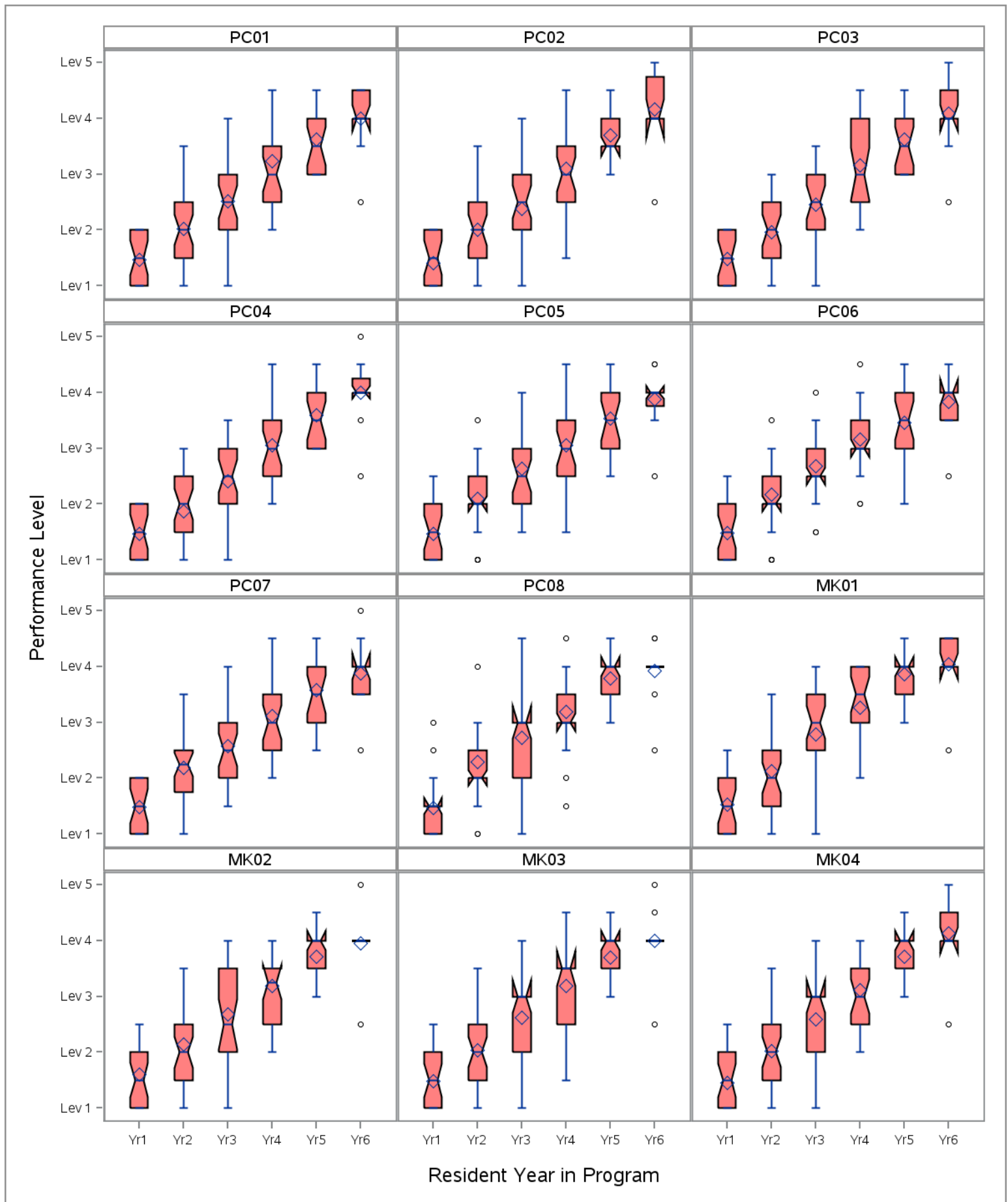
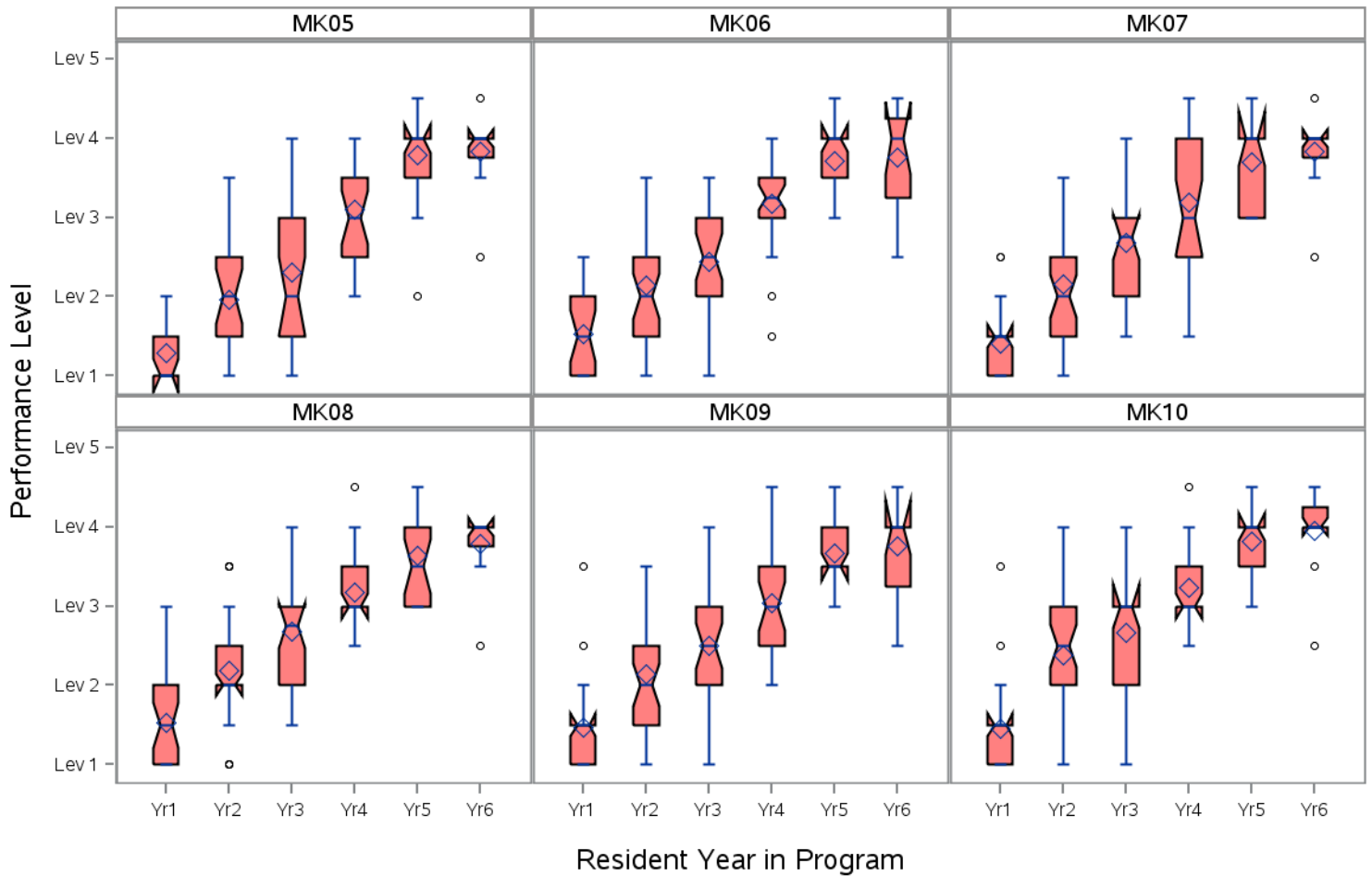


Table 138 - Thoracic surgery - integrated (June 2017)



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Table 138 - Thoracic surgery - integrated (June 2017)

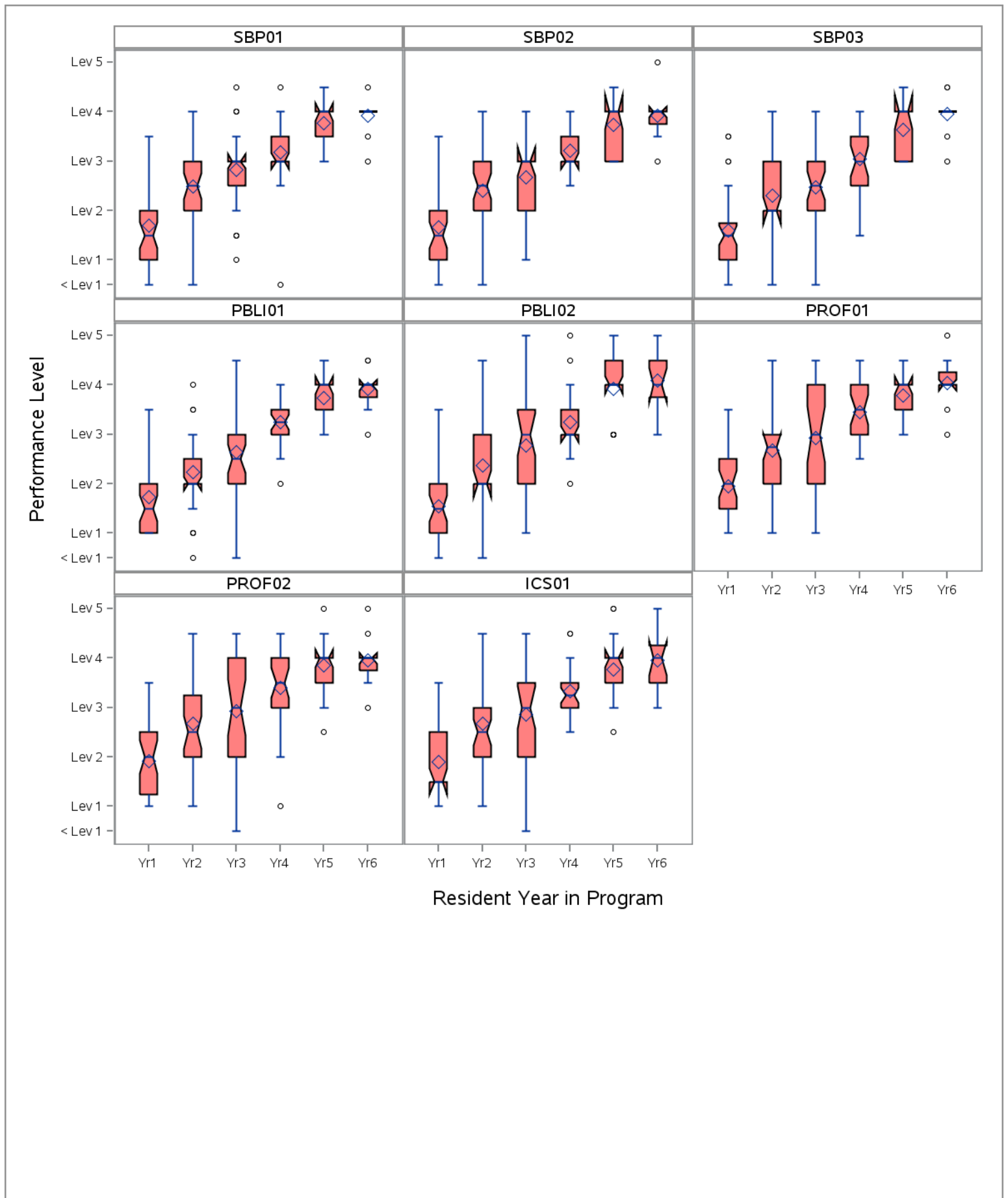
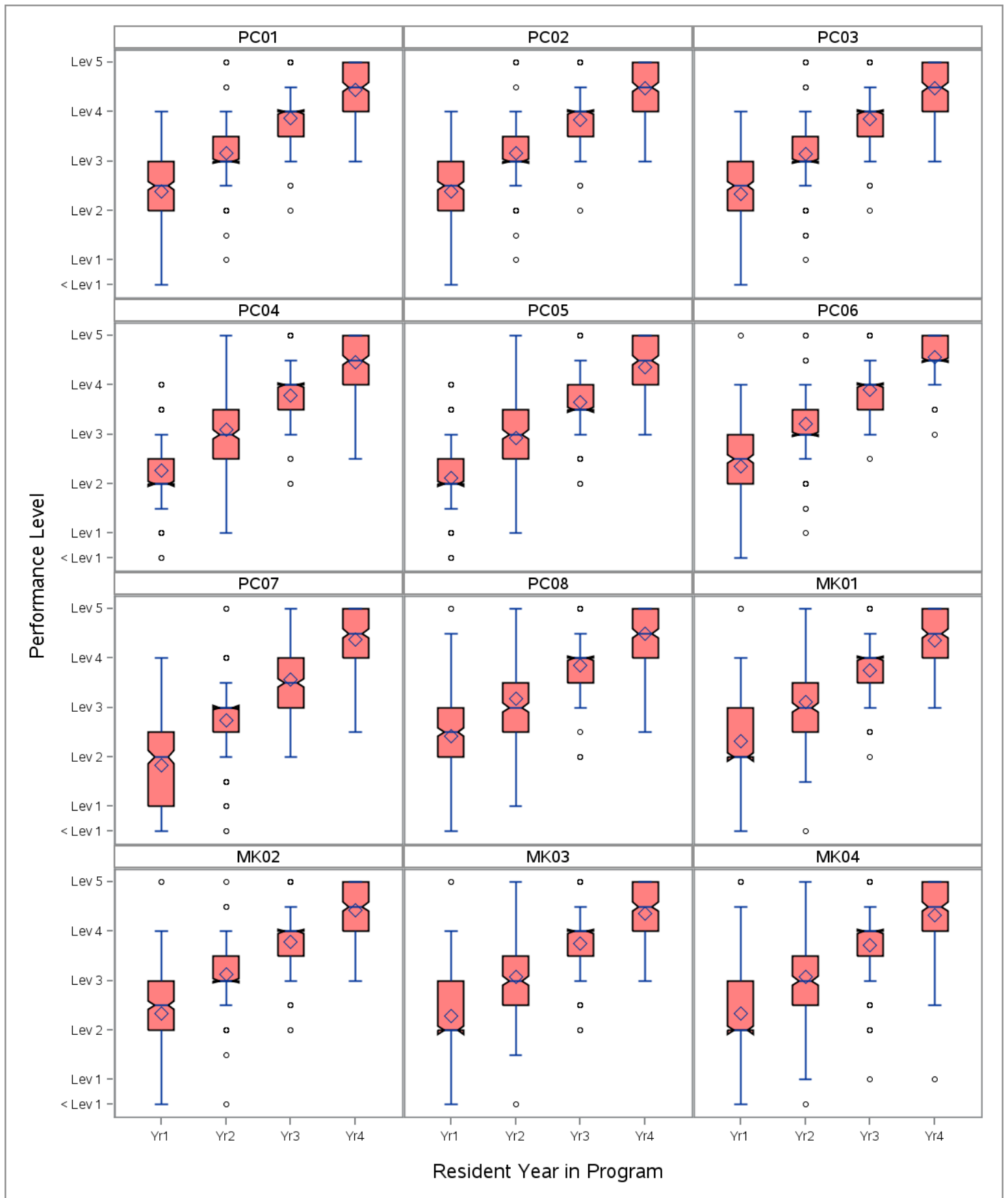
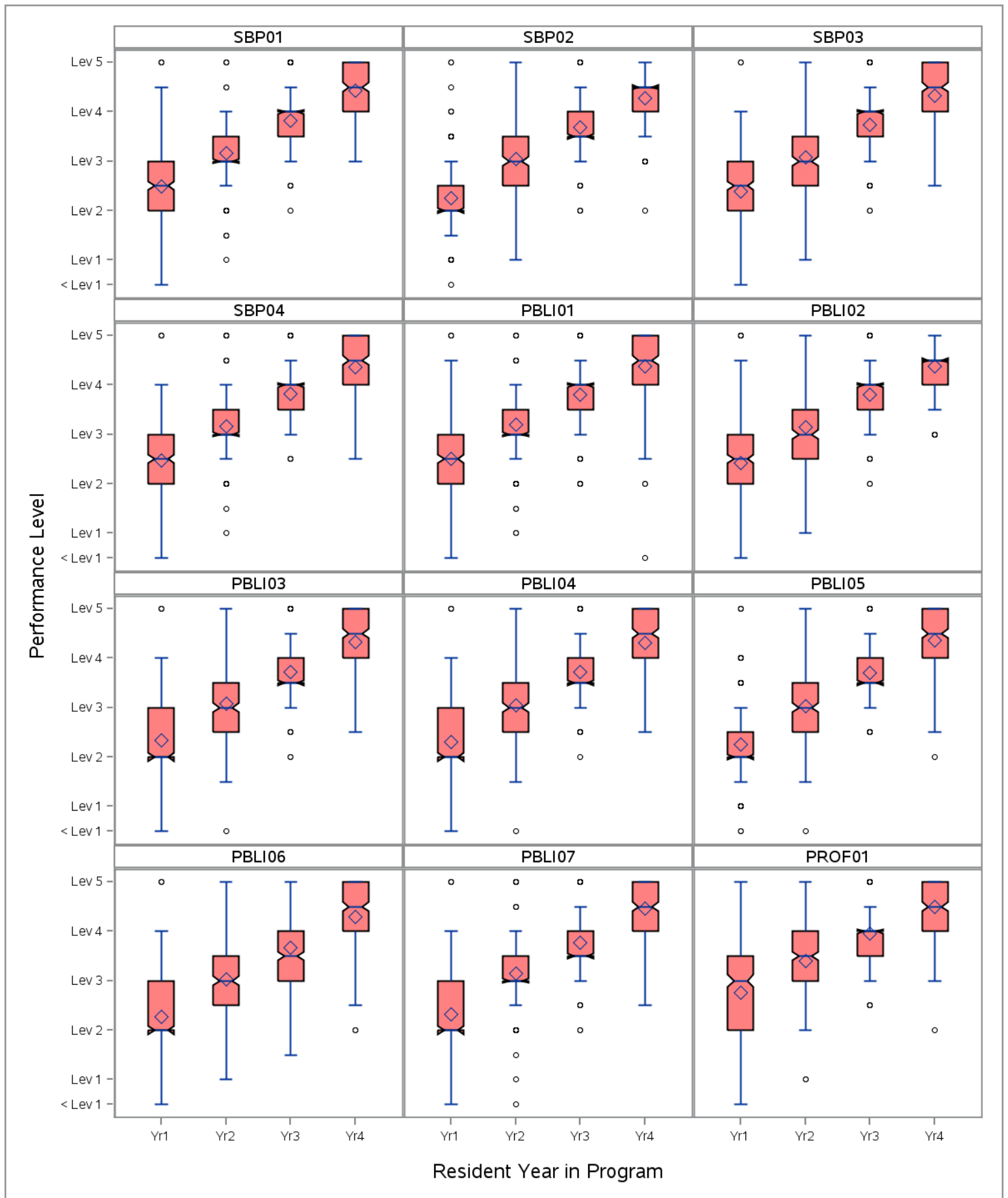


Table 139 - Urology (June 2017)



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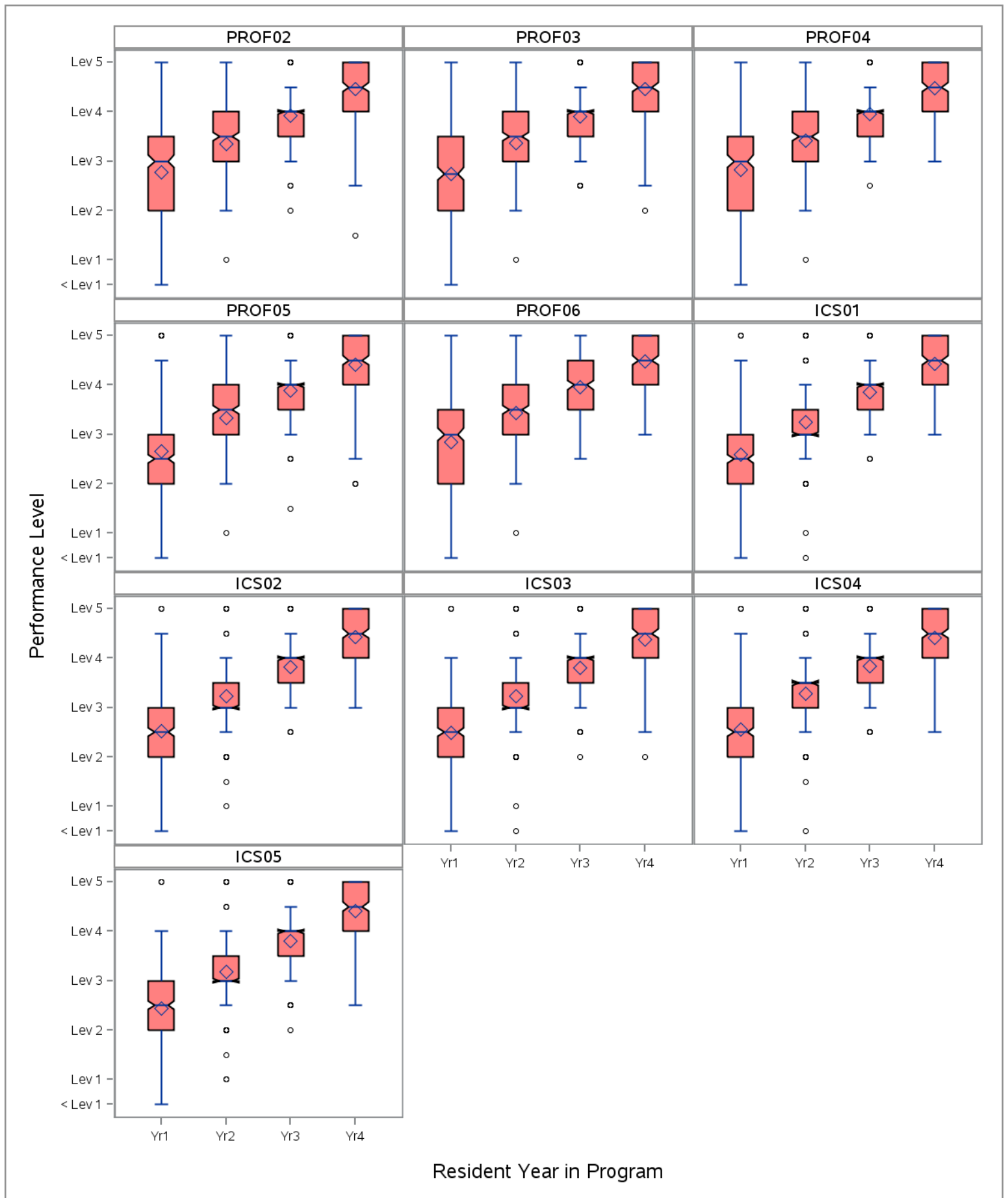
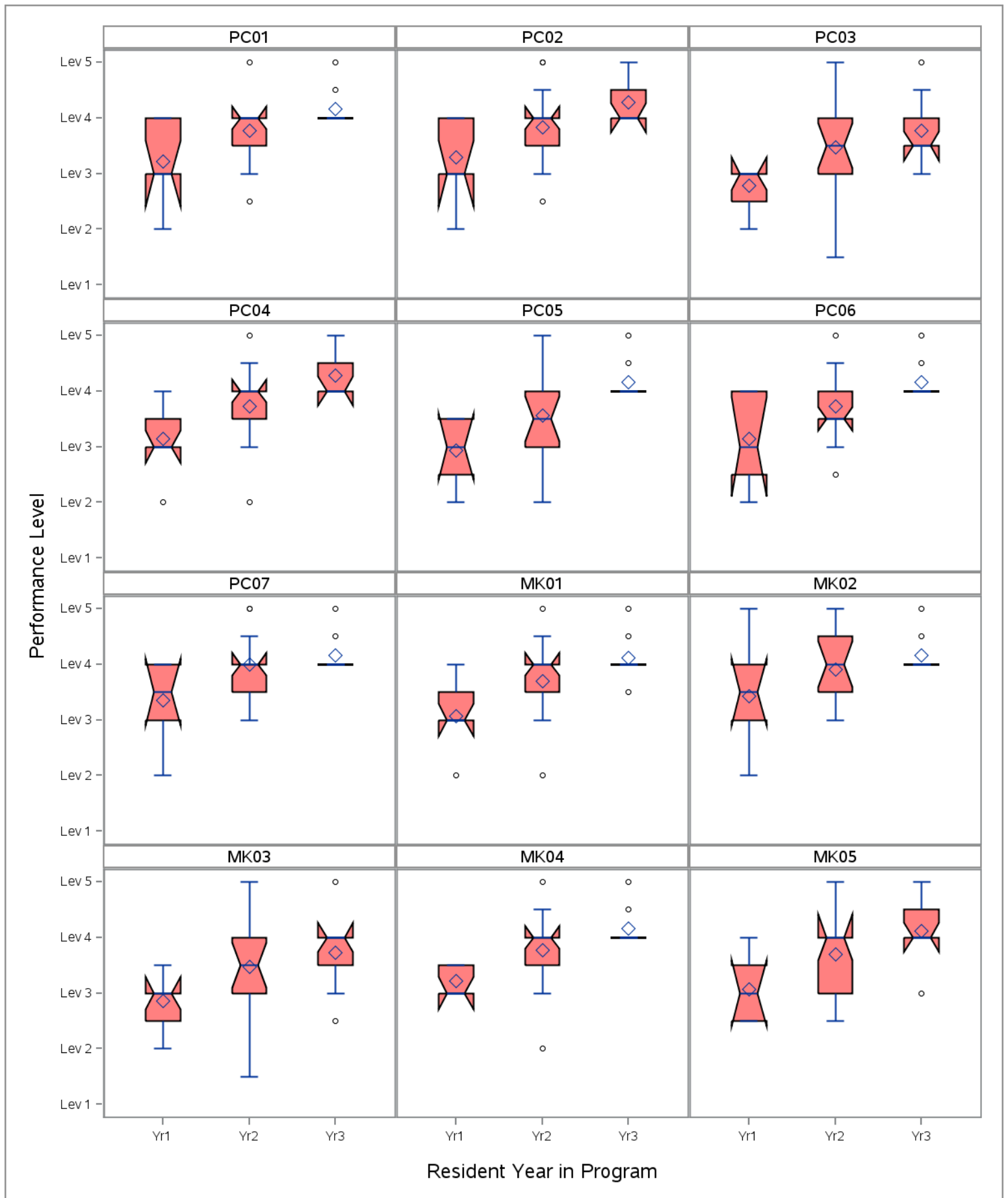
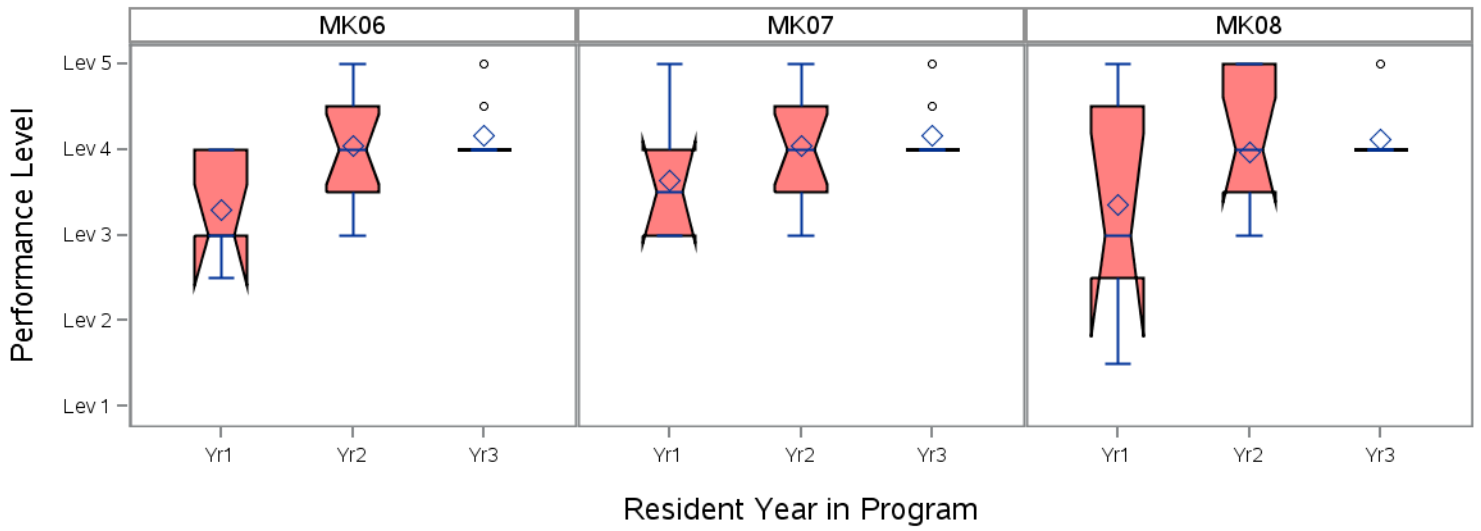


Table 140 - Female pelvic medicine and reconstructive surgery (June 2017)



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Continue to next page for Female pelvic medicine and reconstructive surgery

Table 140 - Female pelvic medicine and reconstructive surgery (June 2017)

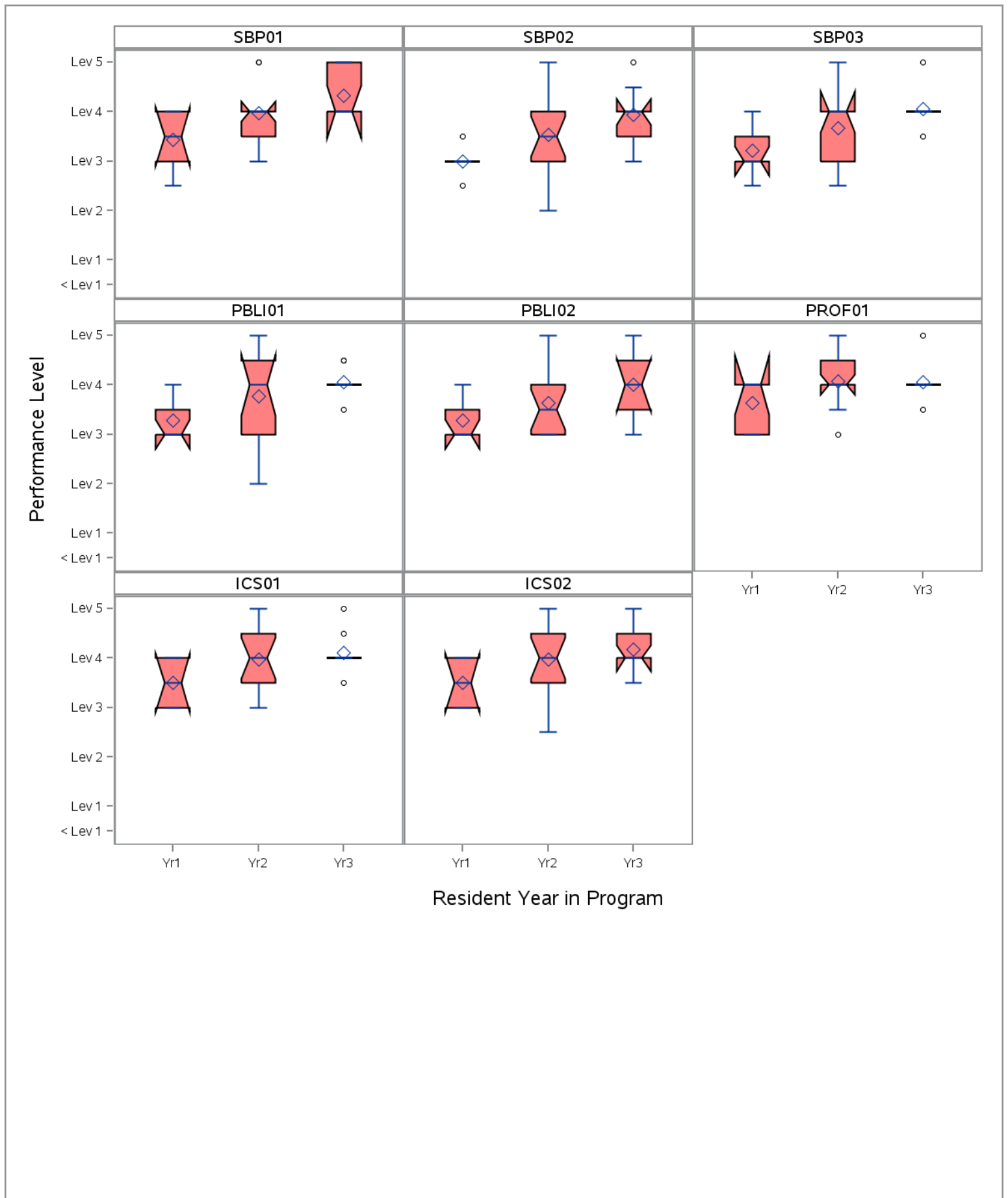
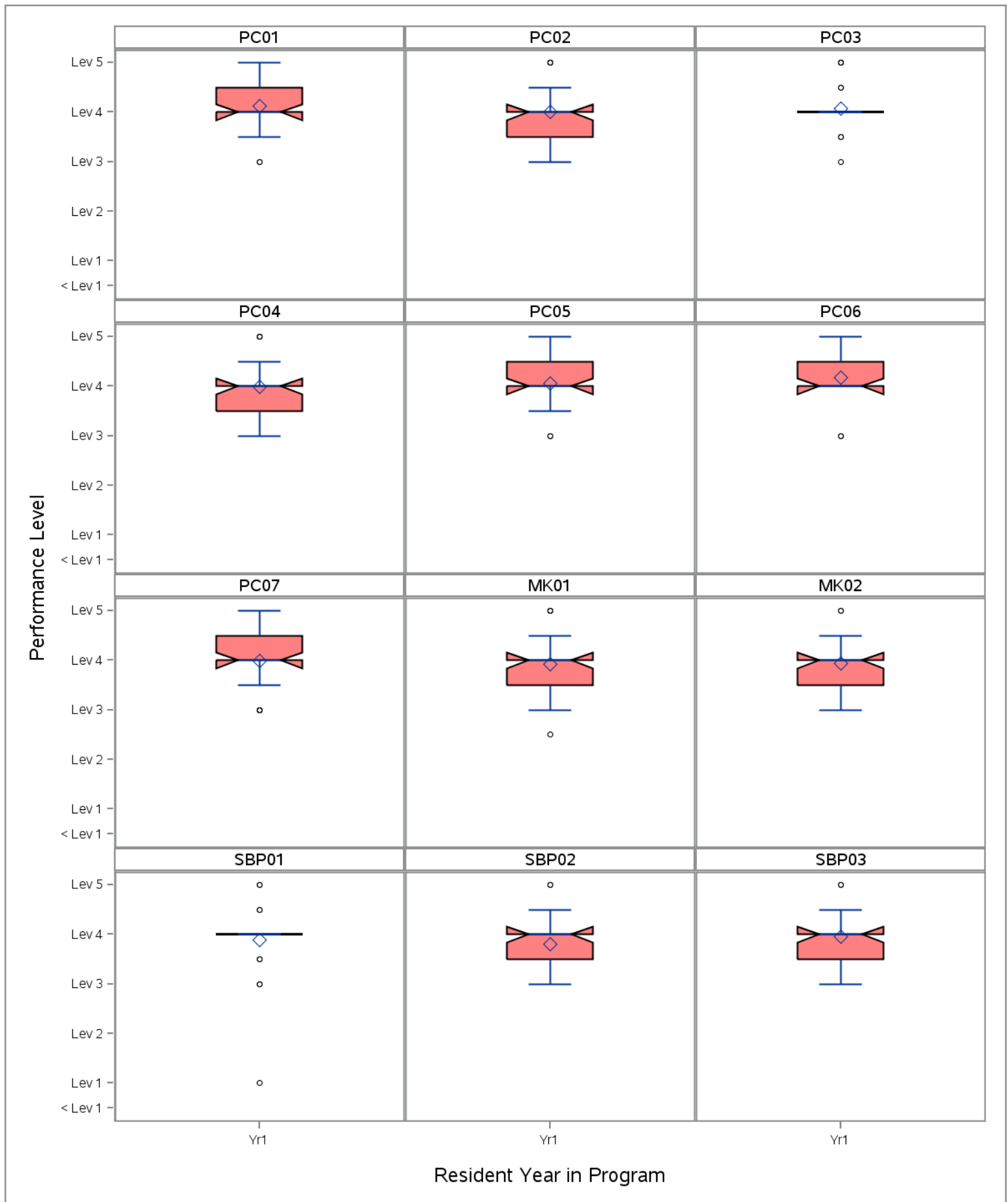


Table 141 - Pediatric urology (June 2017)



Continue to next page for Pediatric urology

Table 141 - Pediatric urology (June 2017)

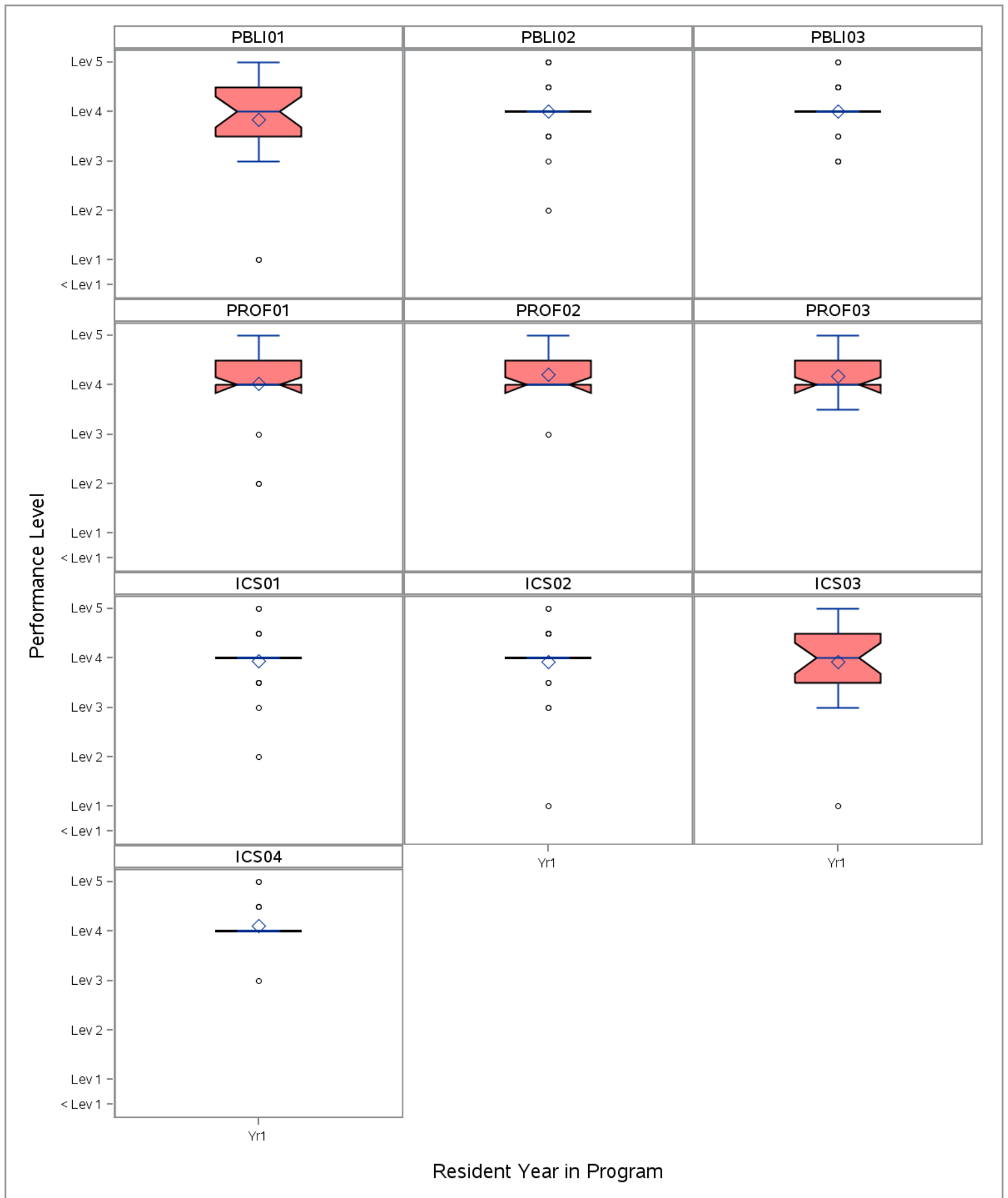
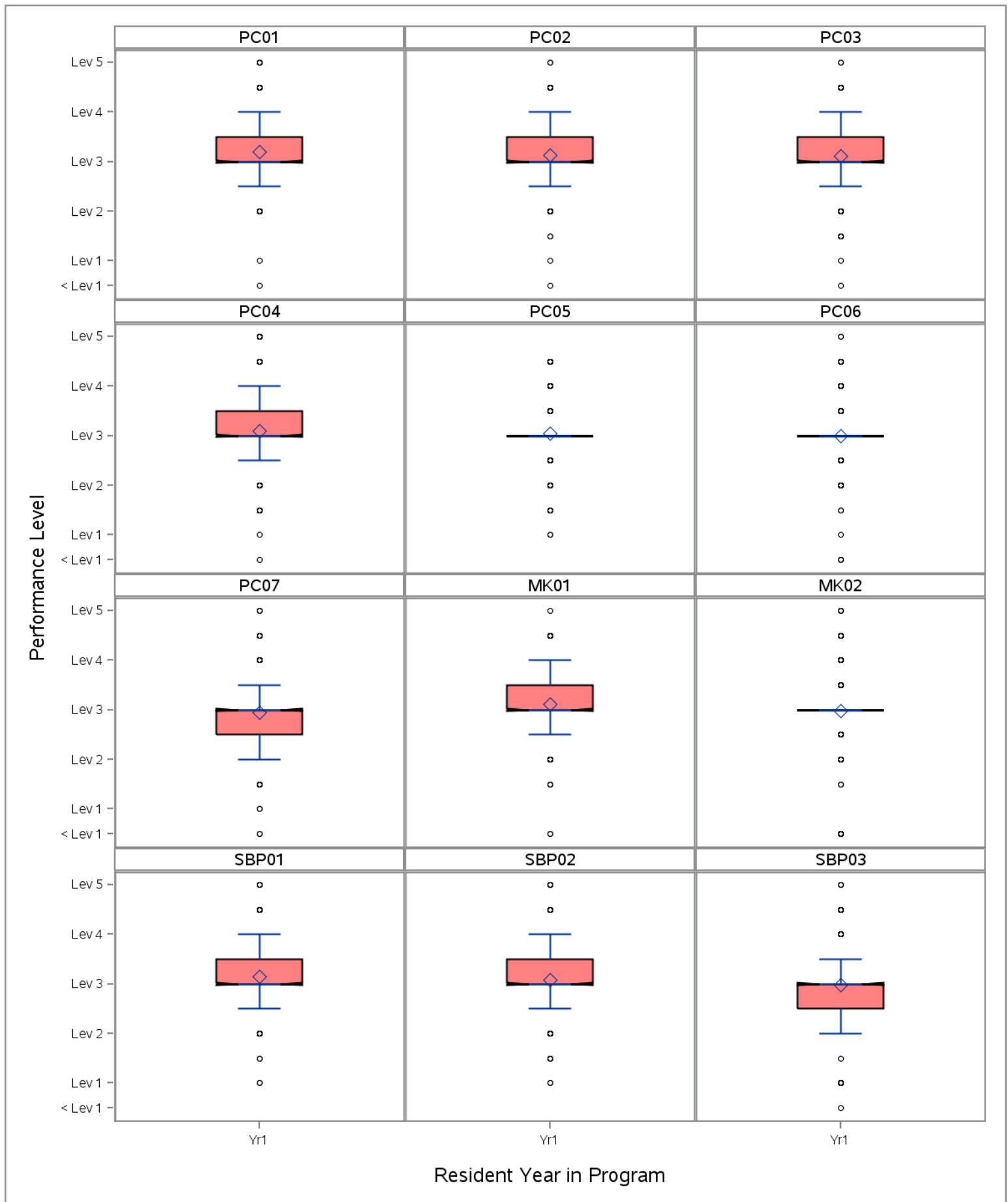


Table 142 - Transitional year (June 2017)



Continue to next page for Transitional year

Table 142 - Transitional year (June 2017)

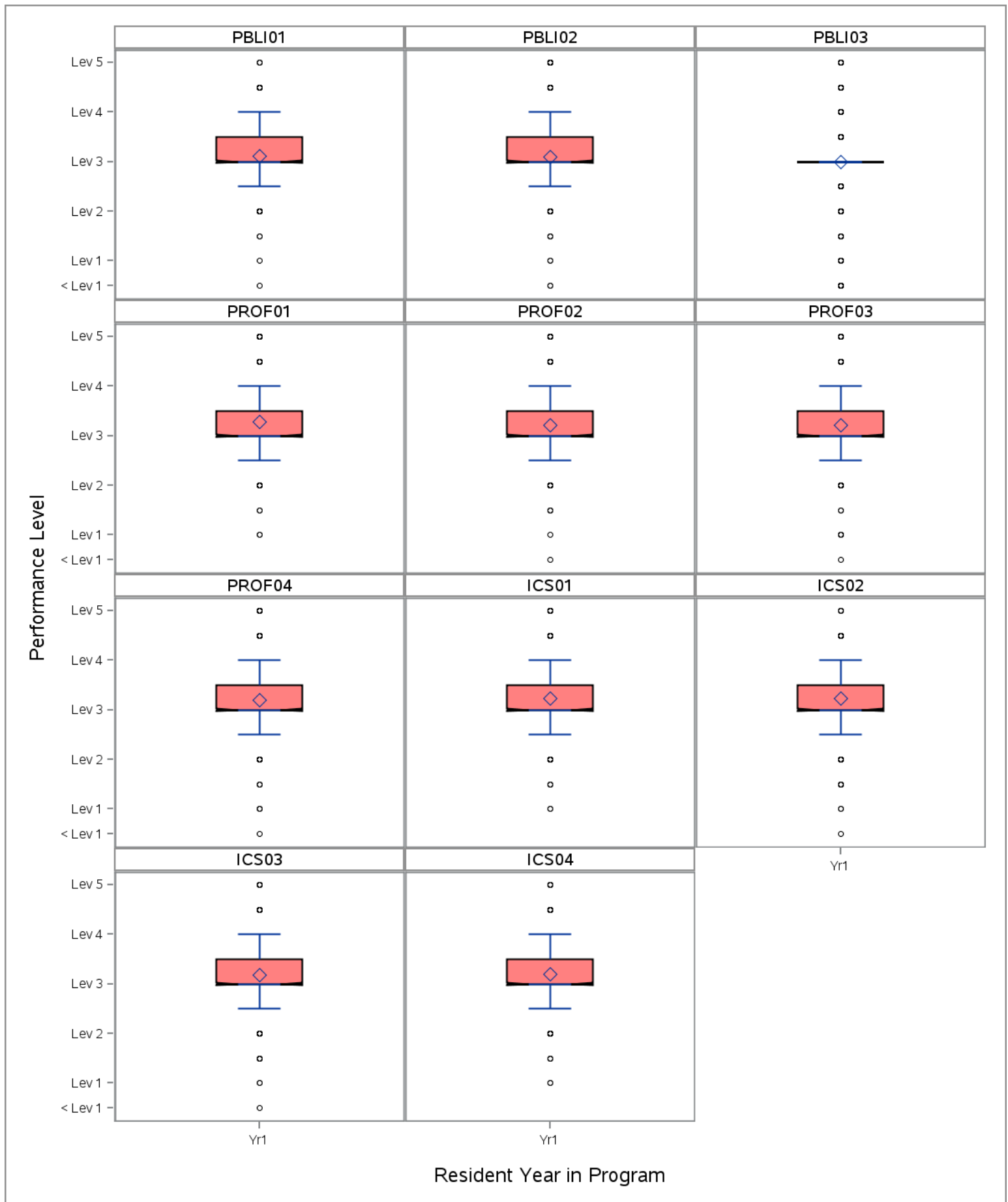
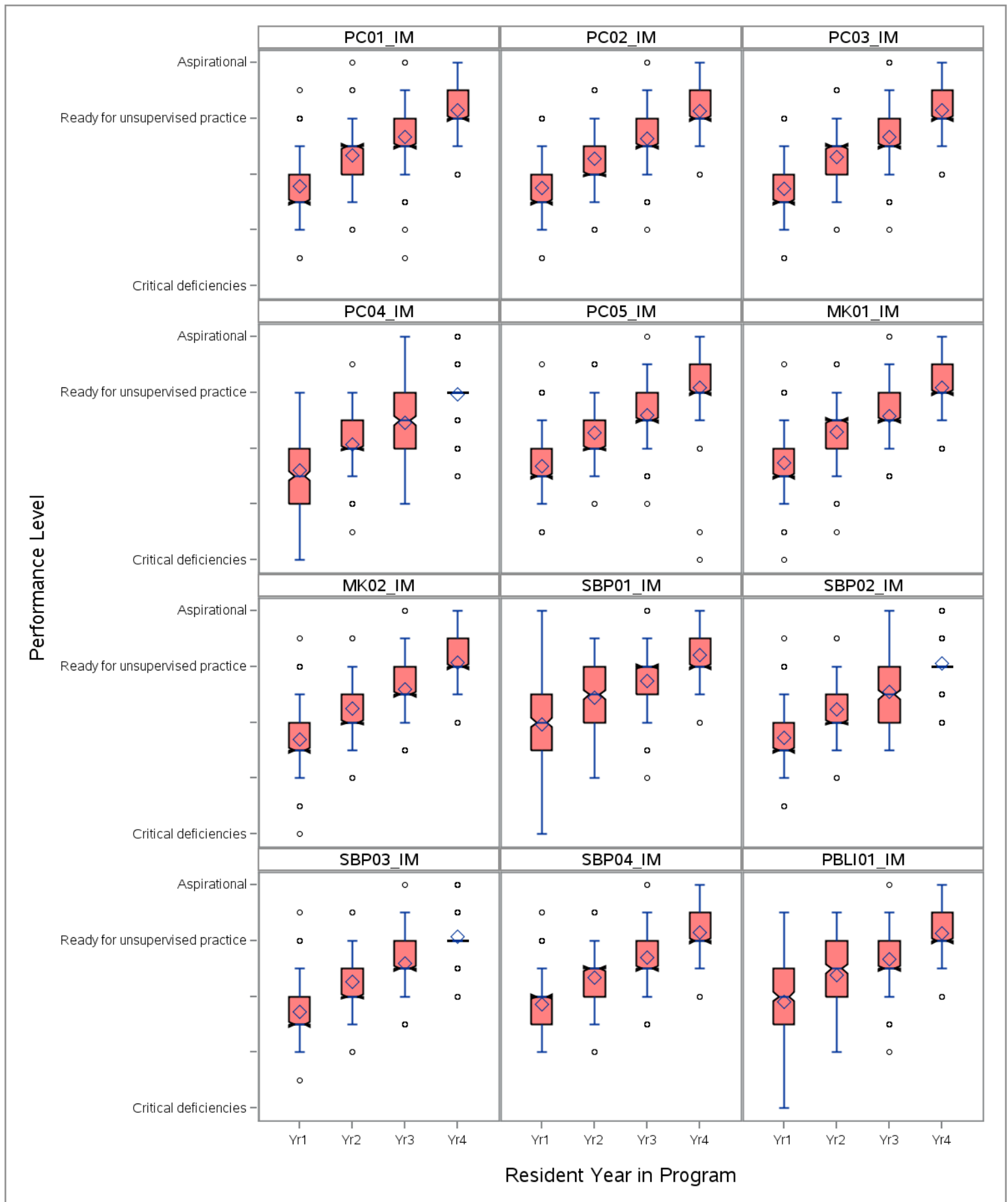
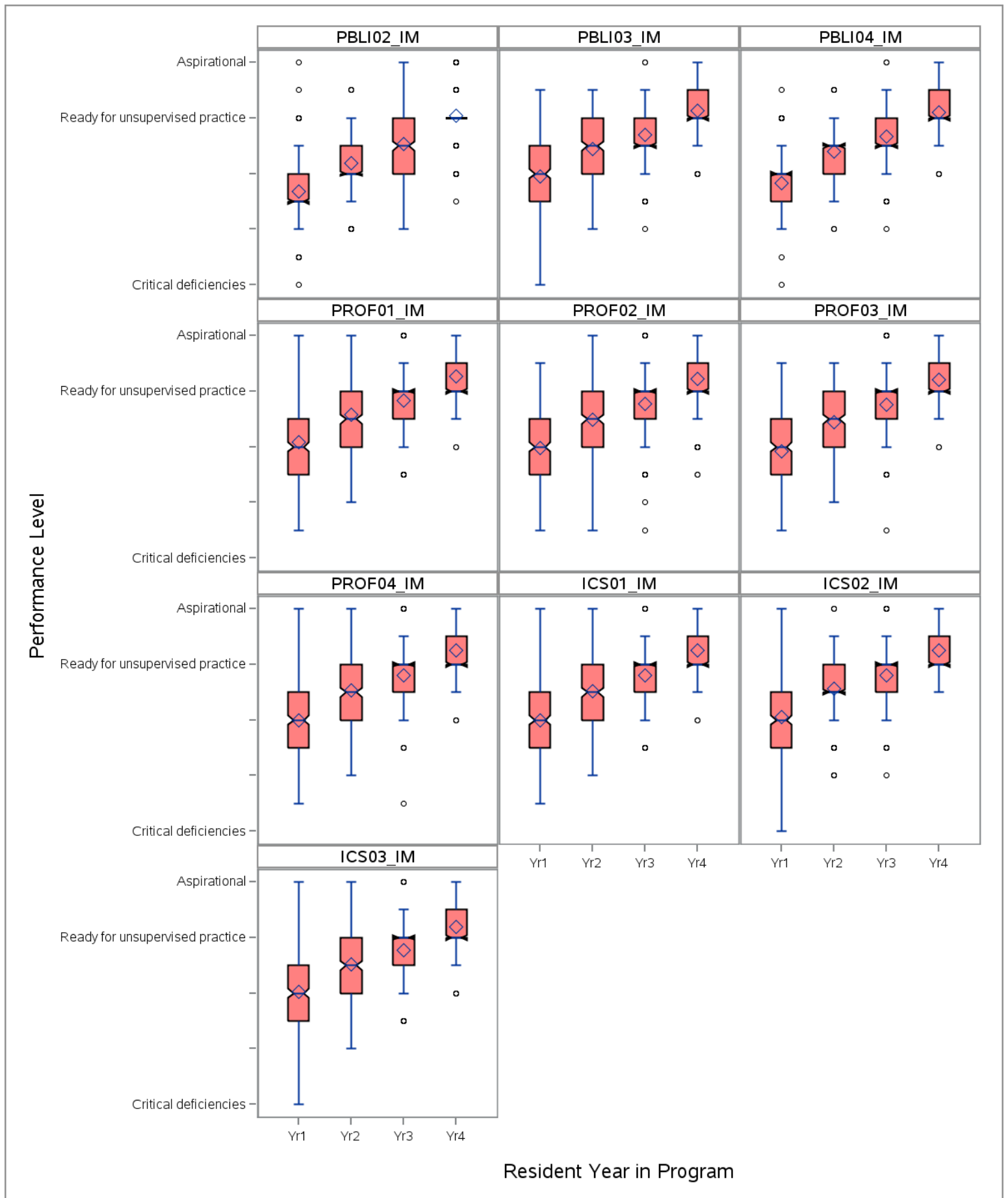


Table 143 - Internal medicine/Pediatrics (June 2017)



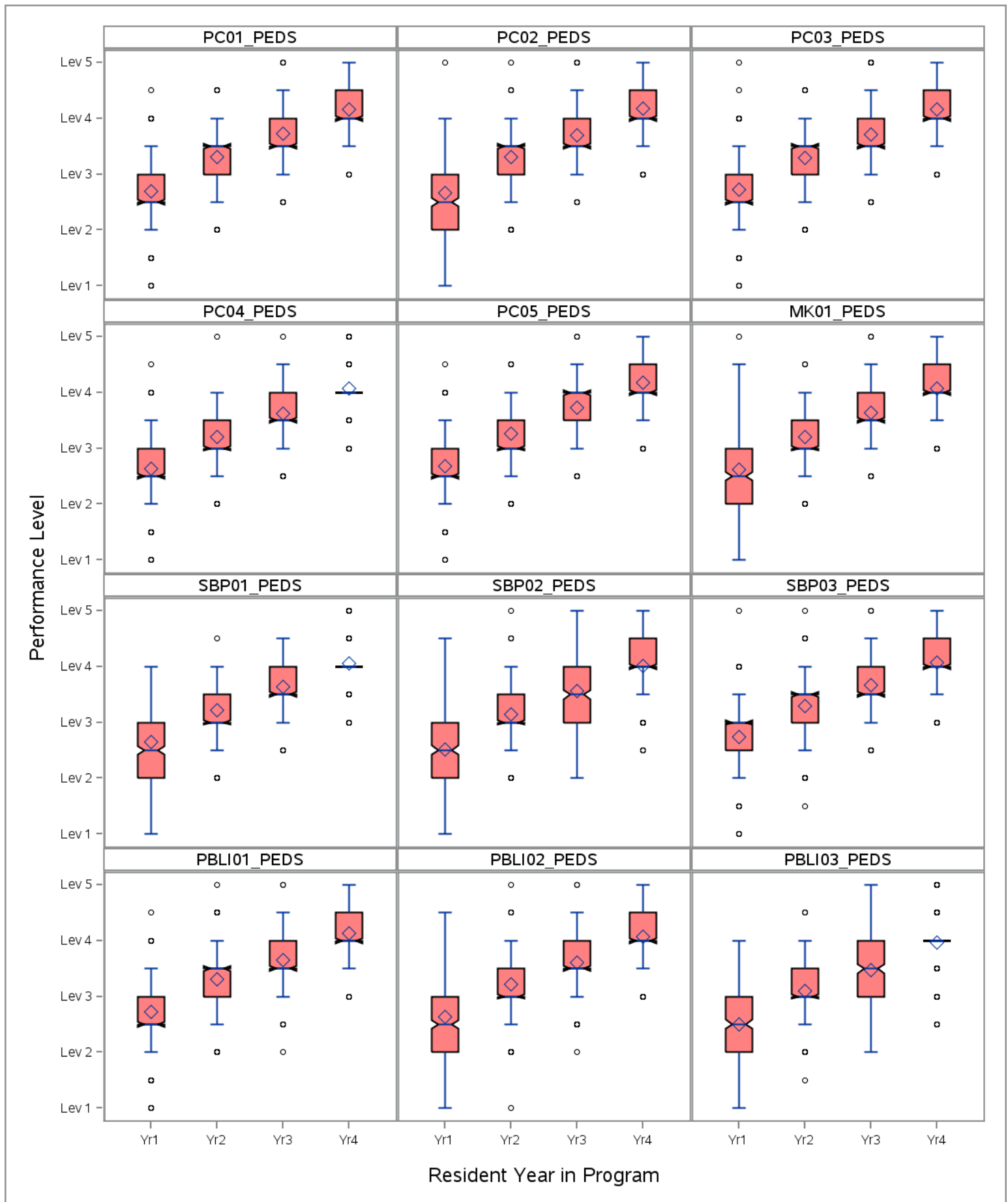
Continue to next page for Internal medicine/Pediatrics

Table 143 - Internal medicine/Pediatrics (June 2017)



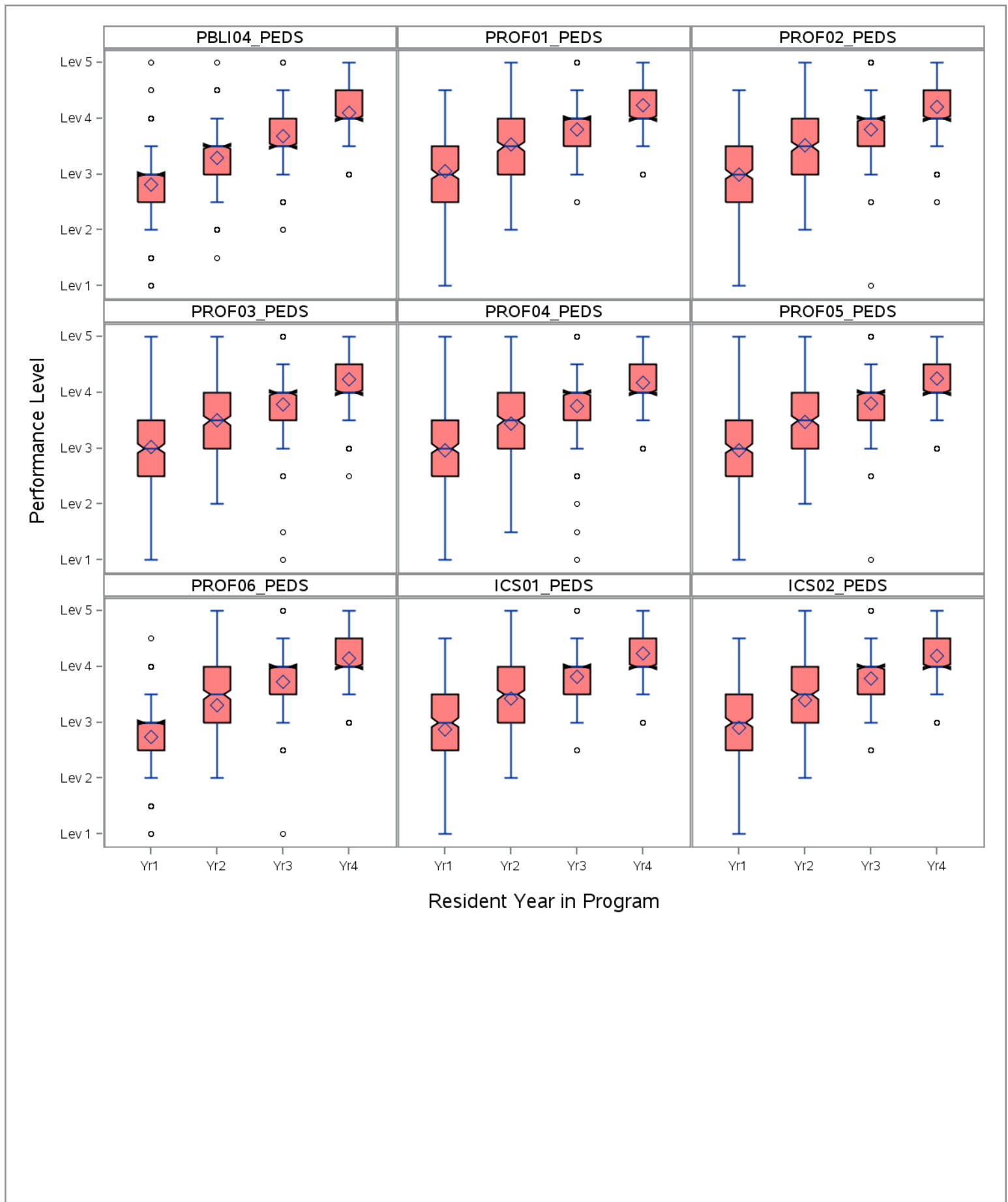
Continue to next page for Internal medicine/Pediatrics

Table 143 - Internal medicine/Pediatrics (June 2017)



Continue to next page for Internal medicine/Pediatrics

Table 143 - Internal medicine/Pediatrics (June 2017)



Appendix A - Milestones Annotated Bibliography

(Note: the content that follows comes from a variety of sources, and therefore may use different styles, spellings, and references to content and terminology than the remainder of this report.)

National

The emergency medicine milestones: a validation study.

[Korte RC](#), [Beeson MS](#), [Russ CM](#), [Carter WA](#); [Emergency Medicine Milestones Working Group](#), [Reisdorff EJ. Acad Emerg Med.](#) 2013 Jul;20(7):730-5. doi: 10.1111/acem.12166.

Abstract

OBJECTIVES:

The Accreditation Council for Graduate Medical Education (ACGME) and the American Board of Medical Specialties sought to define milestones for skill and knowledge acquisition during residency training. Milestones are significant objective observable events. The milestones are listed within a structure that is derived from the ACGME general competencies. Major groups of milestones are called "subcompetencies." The original 24 subcompetencies containing 255 milestones for emergency medicine (EM) were developed through a multiorganizational group representing most EM stakeholder groups. To assure that the milestones reflected EM resident progress throughout training, the EM Milestones Working Group (EM MWG) sought to validate the individual milestones.

METHODS:

A computer-based survey was sent to all EM residency programs. The survey period began on April 30, 2012, and concluded on May 15, 2012. Respondents were asked to assign each milestone to a specific level of skill or knowledge acquisition. These levels ranged from a beginning resident to an accomplished clinician. There were two different forms that divided the milestones into two groups of 12 subcompetencies each. Surveys were randomly assigned to programs.

RESULTS:

There were five respondents (the program director and four key faculty) requested from each of the 159 residences. There were responses from 96 programs (60.4%). Of the 795 survey recipients, 28 were excluded due to prior exposure to the EM milestones. Of the remaining 767 potential respondents, 281 completed the survey (36.6%) within a 16-day period. Based on the survey results, the working group adjusted the milestones in the following ways: one entire subcompetency (teaching) was eliminated, six new milestones were created, 34 milestones were eliminated, 26 milestones were reassigned to a lower level score, and 20 were reassigned to a higher level. Nineteen milestones were edited to provide greater clarity. The final result was 227 discrete milestones among 23 subcompetencies.

CONCLUSIONS:

The EM milestones were validated through a milestone assignment process using a computer-based survey completed by program directors and key faculty. Milestones were revised in accordance with the results to better align assignment within each performance level.

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Initial Validity Analysis of the Emergency Medicine Milestones.

[Beeson MS](#), [Holmboe ES](#), [Korte RC](#), [Nasca TJ](#), [Brigham T](#), [Russ CM](#), [Whitley CT](#), [Reisdorff EJ](#). *Acad Emerg Med*. 2015 Jul;22(7):838-44. doi: 10.1111/acem.12697. Epub 2015 Jun 25.

Abstract

OBJECTIVES:

The Accreditation Council for Graduate Medical Education (ACGME) Milestones describe behavioral markers for the progressive acquisition of competencies during residency. As a key component of the Next Accreditation System, all residents are evaluated for the acquisition of specialty-specific Milestones. The objective was to determine the validity and reliability of the emergency medicine (EM) Milestones.

METHODS:

The ACGME and the American Board of Emergency Medicine performed this single-event observational study. The data included the initial EM Milestones performance ratings of all categorical EM residents submitted to the ACGME from October 31, 2013, to January 6, 2014. Mean performance ratings were determined for all 23 subcompetencies for every year of residency training. The internal consistency (reliability) of the Milestones was determined using a standardized Cronbach's alpha coefficient. Exploratory factor analysis was conducted to determine how the subcompetencies were interrelated.

RESULTS:

EM Milestone performance ratings were obtained on 100% of EM residents (n = 5,805) from 162 residency programs. The mean performance ratings of the aggregate and individual subcompetency scores showed discrimination between residency years, and the factor structure further supported the validity of the EM Milestones. The reliability was $\alpha = 0.96$ within each year of training.

CONCLUSIONS:

The EM Milestones demonstrated validity and reliability as an assessment instrument for competency acquisition. EM residents can be assured that this evaluation process has demonstrated validity and reliability; faculty can be confident that the Milestones are psychometrically sound; and stakeholders can know that the Milestones are a nationally standardized, objective measure of specialty-specific competency acquisition.

The Internal Medicine Reporting Milestones: Cross-sectional Description of Initial Implementation in U.S. Residency Programs.

[Hauer KE](#), [Clauser J](#), [Lipner RS](#), [Holmboe ES](#), [Caverzagie K](#), [Hamstra SJ](#), [Hood S](#), [Iobst W](#), [Warm E](#), [McDonald FS](#). *Ann Intern Med*. 2016 Sep 6;165(5):356-62. doi: 10.7326/M15-2411. Epub 2016 May 10.

Abstract

BACKGROUND:

High-quality assessment of resident performance is needed to guide individual residents' development and ensure their preparedness to provide patient care. To facilitate this aim, reporting milestones are now required across all internal medicine (IM) residency programs.

OBJECTIVE:

To describe initial milestone ratings for the population of IM residents by IM residency programs.

DESIGN:

Cross-sectional study.

SETTING:

IM residency programs.

PARTICIPANTS:

All IM residents whose residency program directors submitted milestone data at the end of the 2013-2014 academic year.

MEASUREMENTS:

Ratings addressed 6 competencies and 22 subcompetencies. A rating of "not assessable" indicated insufficient information to evaluate the given subcompetency. Descriptive statistics were calculated to describe ratings across competencies and training years.

RESULTS:

Data were available for all 21 774 U.S. IM residents from all 383 programs. Overall, 2889 residents (1621 in postgraduate year 1 [PGY-1], 902 in PGY-2, and 366 in PGY-3) had at least 1 subcompetency rated as not assessable. Summaries of average ratings by competency and training year showed higher ratings for PGY-3 residents in all competencies. Overall ratings for each of the 6 individual competencies showed that fewer than 1% of third-year residents were rated as "unsatisfactory" or "conditional on improvement." However, when subcompetency milestone ratings were used, 861 residents (12.8%) who successfully completed training had at least 1 competency with all corresponding subcompetencies graded below the threshold of "readiness for unsupervised practice."

LIMITATION:

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Data were derived from a point in time in the first reporting period in which milestones were used.

CONCLUSION:

The initial milestone-based evaluations of IM residents nationally suggest that documenting developmental progression of competency is possible over training years. Subcompetencies may identify areas in which residents might benefit from additional feedback and experience. Future work is needed to explore how milestones are used to support residents' development and enhance residency curricula.

Correlations Between Ratings on the Resident Annual Evaluation Summary and the Internal Medicine Milestones and Association With ABIM Certification Examination Scores Among US Internal Medicine Residents, 2013-2014.

[Hauer KE, Vandergrift J, Hess B, Lipner RS, Holmboe ES, Hood S, Iobst W, Hamstra SJ, McDonald FS. JAMA. 2016 Dec 6;316\(21\):2253-2262. doi: 10.1001/jama.2016.17357.](#)

Abstract

Importance:

US internal medicine residency programs are now required to rate residents using milestones. Evidence of validity of milestone ratings is needed.

Objective:

To compare ratings of internal medicine residents using the pre-2015 resident annual evaluation summary (RAES), a nondevelopmental rating scale, with developmental milestone ratings.

Design, Setting, and Participants:

Cross-sectional study of US internal medicine residency programs in the 2013-2014 academic year, including 21 284 internal medicine residents (7048 postgraduate-year 1 [PGY-1], 7233 PGY-2, and 7003 PGY-3).

Exposures:

Program director ratings on the RAES and milestone ratings.

Main Outcomes and Measures:

Correlations of RAES and milestone ratings by training year; correlations of medical knowledge ratings with American Board of Internal Medicine (ABIM) certification examination scores; rating of unprofessional behavior using the 2 systems.

Results:

Corresponding RAES ratings and milestone ratings showed progressively higher correlations across training years, ranging among competencies from 0.31 (95% CI, 0.29 to 0.33) to 0.35 (95% CI, 0.33 to

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0.37) for PGY-1 residents to 0.43 (95% CI, 0.41 to 0.45) to 0.52 (95% CI, 0.50 to 0.54) for PGY-3 residents (all P values <.05). Linear regression showed ratings differed more between PGY-1 and PGY-3 years using milestone ratings than the RAES (all P values <.001). Of the 6260 residents who attempted the certification examination, the 618 who failed had lower ratings using both systems for medical knowledge than did those who passed (RAES difference, -0.9; 95% CI, -1.0 to -0.8; P < .001; milestone medical knowledge 1 difference, -0.3; 95% CI, -0.3 to -0.3; P < .001; and medical knowledge 2 difference, -0.2; 95% CI, -0.3 to -0.2; P < .001). Of the 26 PGY-3 residents with milestone ratings indicating deficiencies on either of the 2 medical knowledge subcompetencies, 12 failed the certification examination. Correlation of RAES ratings for professionalism with residents' lowest professionalism milestone ratings was 0.44 (95% CI, 0.43 to 0.45; P < .001).

Conclusions and Relevance:

Among US internal medicine residents in the 2013-2014 academic year, milestone-based ratings correlated with RAES ratings but with a greater difference across training years. Both rating systems for medical knowledge correlated with ABIM certification examination scores. Milestone ratings may better detect problems with professionalism. These preliminary findings may inform establishment of the validity of milestone-based assessment.

Examining the Functioning and Reliability of the Family Medicine Milestones.

[Peabody MR, O'Neill TR, Peterson LE. J Grad Med Educ. 2017 Feb;9\(1\):46-53. doi: 10.4300/JGME-D-16-00172.1.](#)

Abstract

BACKGROUND:

The Family Medicine (FM) Milestones are a framework designed to assess development of residents in key dimensions of physician competency. Residency programs use the milestones in semiannual reviews of resident performance from entry toward graduation.

OBJECTIVE:

To examine the functioning and reliability of the FM Milestones and to determine whether they measure the amount of a latent trait (eg, knowledge or ability) possessed by a resident or simply indicate where a resident falls along the training sequence.

METHODS:

This study utilized the Rasch Partial Credit model to examine academic year 2014-2015 ratings for 10563 residents from 476 residency programs (postgraduate year [PGY] 1 = 3639; PGY-2 = 3562; PGY-3 = 3351; PGY-4 = 11).

RESULTS:

Reliability was exceptionally high at 0.99. Mean scores were 3.2 (SD = 1.3) for PGY-1; 5.0 (SD = 1.3) for PGY-2; 6.7 (SD = 1.2) for PGY-3; and 7.4 (SD = 1.0) for PGY-4. Keyform analysis showed a rating on 1 item was likely to be similar for all other items.

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CONCLUSIONS:

Our findings suggest that FM Milestones seem to largely function as intended. Lack of spread in item difficulty and lack of variation in category probabilities show that FM Milestones do not measure the amount of a latent trait possessed by a resident, but rather describe where a resident falls along the training sequence. High reliability indicates residents are being rated in a stable manner as they progress through residency, and individual residents deviating from this rating structure warrant consideration by program leaders.

The Effect and Use of Milestones in the Assessment of Neurological Surgery Residents and Residency Programs.

[Conforti LN](#), [Yaghmour NA](#), [Hamstra SJ](#), [Holmboe ES](#), [Kennedy B](#), [Liu JJ](#), [Waldo H](#), [Selden NR](#). *J Surg Educ*. 2017 Jun 21. pii: S1931-7204(17)30278-7. doi: 10.1016/j.jsurg.2017.06.001. [Epub ahead of print]

Abstract

OBJECTIVES:

The purpose of this study was to determine the effect of the Accreditation Council for Graduate Medical Education Milestones on the assessment of neurological surgery residents. The authors sought to determine the feasibility, acceptability, and utility of this new framework in making judgments of progressive competence, its implementation within programs, and the influence on curricula. Residents were also surveyed to elicit the effect of Milestones on their educational experience and professional development.

DESIGN, SETTING, AND PARTICIPANTS:

In 2015, program leadership and residents from 21 neurological surgery residency programs participated in an online survey and telephone interview in which they reflected on their experiences with the Milestones. Survey data were analyzed using descriptive statistics. Interview transcripts were analyzed using grounded theory.

RESULTS:

Response themes were categorized into 2 groups: outcomes of the Milestones implementation process, and facilitators and barriers. Because of Milestones implementation, participants reported changes to the quality of the assessment process, including the ability to identify struggling residents earlier and design individualized improvement plans. Some programs revised their curricula based on training gaps identified using the Milestones. Barriers to implementation included limitations to the adoption of a developmental progression model in the context of rotation block schedules and misalignment between progression targets and clinical experience. The shift from time-based to competency-based evaluation presented an ongoing adjustment for many programs. Organized preparation before clinical competency committee meetings and diverse clinical competency committee composition led to more productive meetings and perceived improvement in promotion decisions.

CONCLUSIONS:

The results of this study can be used by program leadership to help guide further implementation of the Milestones and program improvement. These results also help to guide the evolution of Milestones language and their implementation across specialties.

Multi-institution Studies

Validity Evidence From Ratings of Pediatric Interns and Subinterns on a Subset of Pediatric Milestones.

[Turner TL](#), [Bhavaraju VL](#), [Luciw-Dubas UA](#), [Hicks PJ](#), [Multerer S](#), [Osta A](#), [McDonnell J](#), [Poynter S](#), [Schumacher DJ](#), [Tenney-Soeiro R](#), [Waggoner-Fountain L](#), [Schwartz A](#); and the Association of Pediatric Program Directors Longitudinal Educational Assessment Research Network–National Board of Medical Examiners Pediatrics Milestones Assessment Group. *Acad Med.* 2017 Jun;92(6):809-819. doi: 10.1097/ACM.0000000000001622.

Abstract

PURPOSE:

To investigate evidence for validity of faculty members' pediatric milestone (PM) ratings of interns (first-year residents) and subinterns (fourth-year medical students) on nine subcompetencies related to readiness to serve as a pediatric intern in the inpatient setting.

METHOD:

The Association of Pediatric Program Directors Longitudinal Educational Assessment Research Network (APPD LEARN) and the National Board of Medical Examiners collaborated to investigate the utility of assessments of the PMs for trainees' performance. Data from 32 subinterns and 179 interns at 17 programs were collected from July 2012 through April 2013. Observers used several tools to assess learners. At each site, a faculty member used these data to make judgments about the learner's current developmental milestone in each subcompetency. Linear mixed models were fitted to milestone judgments to examine their relationship with learner's rank and subcompetency.

RESULTS:

On a 5-point developmental scale, mean milestone levels for interns ranged from 3.20 (for the subcompetency Work effectively as a member of a team) to 3.72 (Humanism) and for subinterns from 2.89 (Organize and prioritize care) to 3.61 (Professionalization). Mean milestone ratings were significantly higher for the Professionalism competency (3.59-3.72) for all trainees compared with Patient Care (2.89-3.24) and Personal and Professional Development (3.33-3.51). Mean intern ratings were significantly higher than mean subintern ratings for all nine subcompetencies except Professionalization, Humanism, and Trustworthiness.

CONCLUSIONS:

The PMs had a coherent internal structure and could distinguish between differing levels of trainees, which supports their validation for documenting developmental progression of pediatric trainees.

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Competent for Unsupervised Practice: Use of Pediatric Residency Training Milestones to Assess Readiness.

[Li ST, Tancredi DJ, Schwartz A, Guillot AP, Burke AE, Trimm RF, Guralnick S, Mahan JD, Gifford KA; Association of Pediatric Program Directors \(APPD\) Longitudinal Educational Assessment Research Network \(LEARN\) Validity of Resident Self-Assessment Group. Acad Med. 2017 Mar;92\(3\):385-393. doi: 10.1097/ACM.0000000000001322.](#)

Abstract

PURPOSE:

To describe clinical skills progression during pediatric residency using the distribution of pediatric milestone assessments by subcompetency and year of training and to determine reasonable milestone expectations at time of graduation.

METHOD:

Multi-institutional cohort study of the milestones reported to the Accreditation Council for Graduate Medical Education for all 21 pediatric subcompetencies. Most subcompetencies were measured using five milestone levels (1 = novice, 2 = advanced beginner, 3 = competent, 4 = proficient, 5 = master); 3 subcompetencies had only four levels defined.

RESULTS:

Milestone assessments for 2,030 pediatric residents in 47 programs during academic year 2013-2014 were obtained. There was significant variation in end-of-year milestone ratings for residents within each level of training, which decreased as training level increased. Most (78.9%; 434/550) graduating third-year pediatric residents received a milestone rating of ≥ 3 in all 21 subcompetencies; fewer (21.1%; 116/550) received a rating of ≥ 4 in all subcompetencies. Across all training levels, professionalism and interpersonal communication skills were rated highest; quality improvement was rated lowest.

CONCLUSIONS:

Trainees entered residency with a wide range of skills. As they advanced, skill variability within a training level decreased. Most graduating pediatric residents were still advancing on the milestone continuum toward proficiency and mastery, and an expectation of milestone ratings ≥ 4 in all categories upon graduation is unrealistic; milestone ratings ≥ 3 upon graduation may be more realistic. Understanding current pediatric residents' and graduates' skills can help to identify key areas that should be specifically targeted during training.

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The pediatrics milestones: initial evidence for their use as learning road maps for residents.

[Schumacher DJ](#), [Lewis KO](#), [Burke AE](#), [Smith ML](#), [Schumacher JB](#), [Pitman MA](#), [Ludwig S](#), [Hicks PJ](#), [Guralnick S](#), [Englander R](#), [Benson B](#), [Carraccio C](#). *Acad Pediatr*. 2013 Jan-Feb;13(1):40-7. doi: 10.1016/j.acap.2012.09.003. Epub 2012 Nov 17.

Abstract

OBJECTIVE:

As the next step in competency-based medical education, the Pediatrics Milestone Project seeks to provide a learner-centered approach to training and assessment. To help accomplish this goal, this study sought to determine how pediatric residents understand, interpret, and respond to the Pediatrics Milestones.

METHODS:

Cognitive interviews with 48 pediatric residents from all training levels at 2 training programs were conducted. Each participant reviewed one Pediatrics Milestone document (PMD). Eight total Pediatrics Milestones, chosen for their range of complexity, length, competency domain, and primary author, were included in this study. Six residents, 2 from each year of residency training, reviewed each PMD. Interviews were transcribed and coded using inductive methods, and codes were grouped into themes that emerged.

RESULTS:

Four major themes emerged through coding and analysis: 1) the participants' degree of understanding of the PMDs is sufficient, often deep; 2) the etiology of participants' understanding is rooted in their experiences; 3) there are qualities of the PMD that may contribute to or detract from understanding; and 4) participants apply their understanding by noting the PMD describes a developmental progression that can provide a road map for learning. Additionally, we learned that residents are generally comfortable being placed in the middle of a series of developmental milestones. Two minor themes focusing on interest and practicality were also identified.

CONCLUSIONS:

This study provides initial evidence for the Pediatrics Milestones as learner-centered documents that can be used for orientation, education, formative feedback, and, ultimately, assessment.

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A multi-source feedback tool for measuring a subset of Pediatrics Milestones.

[Schwartz A, Margolis MJ, Multerer S, Haftel HM, Schumacher DJ; APPD LEARN–NBME Pediatrics Milestones Assessment Group^{2,3}. *Med Teach*. 2016 Oct;38\(10\):995-1002. Epub 2016 Mar 30.](#)

Abstract

BACKGROUND:

The Pediatrics Milestones Assessment Pilot employed a new multisource feedback (MSF) instrument to assess nine Pediatrics Milestones among interns and subinterns in the inpatient context.

OBJECTIVE:

To report validity evidence for the MSF tool for informing milestone classification decisions.

METHODS:

We obtained MSF instruments by different raters per learner per rotation. We present evidence for validity based on the unified validity framework.

RESULTS:

One hundred and ninety two interns and 41 subinterns at 18 Pediatrics residency programs received a total of 1084 MSF forms from faculty (40%), senior residents (34%), nurses (22%), and other staff (4%). Variance in ratings was associated primarily with rater (32%) and learner (22%). The milestone factor structure fit data better than simpler structures. In domains except professionalism, ratings by nurses were significantly lower than those by faculty and ratings by other staff were significantly higher. Ratings were higher when the rater observed the learner for longer periods and had a positive global opinion of the learner. Ratings of interns and subinterns did not differ, except for ratings by senior residents. MSF-based scales correlated with summative milestone scores.

CONCLUSION:

We obtain moderately reliable MSF ratings of interns and subinterns in the inpatient context to inform some milestone assignments.

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Comparison of Male vs Female Resident Milestone Evaluations by Faculty During Emergency Medicine Residency Training.

[Dayal A](#), [O'Connor DM](#), [Qadri U](#), [Arora VM](#). JAMA Intern Med. 2017 May 1;177(5):651-657.

Abstract

Importance:

Although implicit bias in medical training has long been suspected, it has been difficult to study using objective measures, and the influence of sex and gender in the evaluation of medical trainees is unknown. The emergency medicine (EM) milestones provide a standardized framework for longitudinal resident assessment, allowing for analysis of resident performance across all years and programs at a scope and level of detail never previously possible.

Objective:

To compare faculty-observed training milestone attainment of male vs female residency training.

Design, Setting, and Participants:

This multicenter, longitudinal, retrospective cohort study took place at 8 community and academic EM training programs across the United States from July 1, 2013, to July 1, 2015, using a real-time, mobile-based, direct-observation evaluation tool. The study examined 33 456 direct-observation subcompetency evaluations of 359 EM residents by 285 faculty members.

Main Outcomes and Measures:

Milestone attainment for male and female EM residents as observed by male and female faculty throughout residency and analyzed using multilevel mixed-effects linear regression modeling.

Results:

A total of 33 456 direct-observation evaluations were collected from 359 EM residents (237 men [66.0%] and 122 women [34.0%]) by 285 faculty members (194 men [68.1%] and 91 women [31.9%]) during the study period. Female and male residents achieved similar milestone levels during the first year of residency. However, the rate of milestone attainment was 12.7% (0.07 levels per year) higher for male residents through all of residency (95% CI, 0.04-0.09). By graduation, men scored approximately 0.15 milestone levels higher than women, which is equivalent to 3 to 4 months of additional training, given that the average resident gains approximately 0.52 levels per year using our model (95% CI, 0.49-0.54). No statistically significant differences in scores were found based on faculty evaluator gender (effect size difference, 0.02 milestone levels; 95% CI for males, -0.09 to 0.11) or evaluator-evaluated gender pairing (effect size difference, -0.02 milestone levels; 95% CI for interaction, -0.05 to 0.01).

Conclusions and Relevance:

Although male and female residents receive similar evaluations at the beginning of residency, the rate of milestone attainment throughout training was higher for male than female residents across all EM subcompetencies, leading to a gender gap in evaluations that continues until graduation. Faculty should be cognizant of possible gender bias when evaluating medical trainees.

Program Director Perceptions of the General Surgery Milestones Project.

[Drolet BC, Marwaha JS, Wasey A, Pallant A. J Surg Educ.](#) 2017 Mar 23. pii: S1931-7204(16)30373-7. doi: 10.1016/j.jsurg.2017.02.012. [Epub ahead of print]

Abstract

OBJECTIVE:

As a result of the Milestones Project, all Accreditation Council for Graduate Medical Education accredited training programs now use an evaluation framework based on outcomes in 6 core competencies. Despite their widespread use, the Milestones have not been broadly evaluated. This study sought to examine program director (PD) perceptions of the Milestones Project.

DESIGN, SETTING, AND PARTICIPANTS:

A national survey of general surgery PDs distributed between January and March of 2016.

RESULTS:

A total of 132 surgical PDs responded to the survey (60% response rate). Positive perceptions included value for education (55%) and evaluation of resident performance (58%), as well as ability of Milestones to provide unbiased feedback (55%) and to identify areas of resident deficiency (58%). Meanwhile, time input and the ability of Milestones to discriminate underperforming programs were less likely to be rated positively (25% and 21%, respectively). Half of PDs felt that the Milestones were an improvement over their previous evaluation system (55%).

CONCLUSIONS:

Using the Milestones as competency-based, developmental outcomes measures, surgical PDs reported perceived benefits for education and objectivity in the evaluation of resident performance. The overall response to the Milestones was generally favorable, and most PDs would not return to their previous evaluation systems. To improve future iterations of the Milestones, many PDs expressed a desire for customization of the Milestones' content and structure to allow for programmatic differences.

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Early feedback on the use of the internal medicine reporting milestones in assessment of resident performance.

[Aagaard E](#), [Kane GC](#), [Conforti L](#), [Hood S](#), [Caverzagie KJ](#), [Smith C](#), [Chick DA](#), [Holmboe ES](#), [Iobst WF](#). *J Grad Med Educ.* 2013 Sep;5(3):433-8

Abstract

BACKGROUND:

The educational milestones were designed as a criterion-based framework for assessing resident progression on the 6 Accreditation Council for Graduate Medical Education competencies.

OBJECTIVE:

We obtained feedback on, and assessed the construct validity and perceived feasibility and utility of, draft Internal Medicine Milestones for Patient Care and Systems-Based Practice.

METHODS:

All participants in our mixed-methods study were members of competency committees in internal medicine residency programs. An initial survey assessed participant and program demographics; focus groups obtained feedback on the draft milestones and explored their perceived utility in resident assessment, and an exit survey elicited input on the value of the draft milestones in resident assessment. Surveys were tabulated using descriptive statistics. Conventional content analysis method was used to assess the focus group data.

RESULTS:

Thirty-four participants from 17 programs completed surveys and participated in 1 of 6 focus groups. Overall, the milestones were perceived as useful in formative and summative assessment of residents. Participants raised concerns about the length and complexity of some draft milestones and suggested specific changes. The focus groups also identified a need for faculty development. In the exit survey, most participants agreed that the Patient Care and Systems-Based Practice Milestones would help competency committees assess trainee progress toward independent practice.

CONCLUSIONS:

Draft reporting milestones for 2 competencies demonstrated significant construct validity in both the content and response process and the perceived utility for the assessment of resident performance. To ensure success, additional feedback from the internal medicine community and faculty development will be necessary.

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Have First-Year Emergency Medicine Residents Achieved Level 1 on Care-Based Milestones?

[Weizberg M](#), [Bond MC](#), [Cassara M](#), [Doty C](#), [Seamon J](#). J Grad Med Educ. 2015 Dec;7(4):589-94

Abstract

BACKGROUND:

Residents in Accreditation Council for Graduate Medical Education accredited emergency medicine (EM) residencies were assessed on 23 educational milestones to capture their progression from medical student level (Level 1) to that of an EM attending physician (Level 5). Level 1 was conceptualized to be at the level of an incoming postgraduate year (PGY)-1 resident; however, this has not been confirmed.

OBJECTIVES:

Our primary objective in this study was to assess incoming PGY-1 residents to determine what percentage achieved Level 1 for the 8 emergency department (ED) patient care-based milestones (PC 1- 8), as assessed by faculty. Secondary objectives involved assessing what percentage of residents had achieved Level 1 as assessed by themselves, and finally, we calculated the absolute differences between self- and faculty assessments.

METHODS:

Incoming PGY-1 residents at 4 EM residencies were assessed by faculty and themselves during their first month of residency. Performance anchors were adapted from ACGME milestones.

RESULTS:

Forty-one residents from 4 programs were included. The percentage of residents who achieved Level 1 for each subcompetency on faculty assessment ranged from 20% to 73%, and on self-assessment from 34% to 92%. The majority did not achieve Level 1 on faculty assessment of milestones PC-2, PC-3, PC-5a, and PC-6, and on self-assessment of PC-3 and PC-5a. Self-assessment was higher than faculty assessment for PC-2, PC-5b, and PC-6.

CONCLUSIONS:

Less than 75% of PGY-1 residents achieved Level 1 for ED care-based milestones. The majority did not achieve Level 1 on 4 milestones. Self-assessments were higher than faculty assessments for several milestones.

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Direct Observation Assessment of Milestones: Problems with Reliability.

[Schott M](#), [Kedia R](#), [Promes SB](#), [Swoboda T](#), [O'Rourke K](#), [Green W](#), [Liu R](#), [Stansfield B](#), [Santen SA](#). [West J Emerg Med](#). 2015 Nov;16(6):871-6. doi: 10.5811/westjem.2015.9.27270. Epub 2015 Oct 22.

INTRODUCTION:

Emergency medicine (EM) milestones are used to assess residents' progress. While some milestone validity evidence exists, there is a lack of standardized tools available to reliably assess residents. Inherent to this is a concern that we may not be truly measuring what we intend to assess. The purpose of this study was to design a direct observation milestone assessment instrument supported by validity and reliability evidence. In addition, such a tool would further lend validity evidence to the EM milestones by demonstrating their accurate measurement.

METHODS:

This was a multi-center, prospective, observational validity study conducted at eight institutions. The Critical Care Direct Observation Tool (CDOT) was created to assess EM residents during resuscitations. This tool was designed using a modified Delphi method focused on content, response process, and internal structure validity. Paying special attention to content validity, the CDOT was developed by an expert panel, maintaining the use of the EM milestone wording. We built response process and internal consistency by piloting and revising the instrument. Raters were faculty who routinely assess residents on the milestones. A brief training video on utilization of the instrument was completed by all. Raters used the CDOT to assess simulated videos of three residents at different stages of training in a critical care scenario. We measured reliability using Fleiss' kappa and interclass correlations.

RESULTS:

Two versions of the CDOT were used: one used the milestone levels as global rating scales with anchors, and the second reflected a current trend of a checklist response system. Although the raters who used the CDOT routinely rate residents in their practice, they did not score the residents' performances in the videos comparably, which led to poor reliability. The Fleiss' kappa of each of the items measured on both versions of the CDOT was near zero.

CONCLUSION:

The validity and reliability of the current EM milestone assessment tools have yet to be determined. This study is a rigorous attempt to collect validity evidence in the development of a direct observation assessment instrument. However, despite strict attention to validity evidence, inter-rater reliability was low. The potential sources of reducible variance include rater- and instrument-based error. Based on this study, there may be concerns for the reliability of other EM milestone assessment tools that are currently in use.

Internal Medicine Residents' Perspectives on Receiving Feedback in Milestone Format.

[Angus S](#), [Moriarty J](#), [Nardino RJ](#), [Chmielewski A](#), [Rosenblum MJ](#). *J Grad Med Educ*. 2015 Jun;7(2):220-4. doi: 10.4300/JGME-D-14-00446.1.

Abstract

BACKGROUND:

In contrast to historical feedback, which was vague or provided residents' numerical scores without clear meaning, milestone-based feedback is focused on specific knowledge, skills, and behaviors that define developmental trajectory. It was anticipated that residents would welcome the more specific and actionable feedback provided by the milestone framework, but this has not been studied.

OBJECTIVE:

We assessed internal medicine (IM) residents' perceptions of receiving feedback in the milestone framework, particularly assessing perception of the utility of milestone-based feedback compared to non-milestone-based feedback.

METHODS:

We surveyed a total of 510 IM residents from 7 institutions. Survey questions assessed resident perception of milestone feedback in identifying strengths, weaknesses, and trajectory of professional development. Postgraduate years 2 and 3 (PGY-2 and PGY-3) residents were asked to compare milestones with prior methods of feedback.

RESULTS:

Of 510 residents, 356 (69.8%) responded. Slightly less than half of the residents found milestone-based feedback "extremely useful" or "very useful" in identifying strengths (44%), weaknesses (43%), specific areas for improvement (45%), and appropriate education progress (48%). Few residents found such feedback "not very useful" or "not at all useful" in these domains. A total of 51% of PGY-2 and PGY-3 residents agreed that receiving milestone-based feedback was more helpful than previous forms of feedback.

CONCLUSIONS:

IM residents are aware of the concepts of milestones, and half of the residents surveyed found milestone feedback more helpful than previous forms of feedback. More work needs to be done to understand how milestone-based feedback could be delivered more effectively to enhance resident development.

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Milestone assessment of minimally invasive surgery in Pediatric Urology fellowship programs.

[Smith PH 3rd](#), [Carpenter M](#), [Herbst KW](#), [Kim C. J](#) *J Pediatr Urol.* 2017 Feb;13(1):110.e1-110.e6. doi: 10.1016/j.jpurol.2016.08.012. Epub 2016 Sep 15

INTRODUCTION:

Minimally invasive surgery has become an important aspect of Pediatric Urology fellowship training. In 2014, the Accreditation Council for Graduate Medical Education published the Pediatric Urology Milestone Project as a metric of fellow proficiency in multiple facets of training, including laparoscopic/robotic procedures.

OBJECTIVE:

The present study assessed trends in minimally invasive surgery training and utilization of the Milestones among recent Pediatric Urology fellows.

STUDY DESIGN:

Using an electronic survey instrument, Pediatric Urology fellowship program directors and fellows who completed their clinical year in 2015 were surveyed. Participants were queried regarding familiarity with the Milestone Project, utilization of the Milestones, robotic/laparoscopic case volume and training experience, and perceived competency with robotic/laparoscopic surgery at the start and end of the fellowship clinical year according to Milestone criteria. Responses were accepted between August and November 2015.

RESULTS:

Surveys were distributed via e-mail to 35 fellows and 30 program directors. Sixteen fellows (46%) and 14 (47%) program directors responded. All fellows reported some robotic experience prior to fellowship, and 69% performed >50 robotic/laparoscopic surgeries during residency. Fellow robotic/laparoscopic case volume varied: three had 1-10 cases (19%), four had 11-20 cases (25%), and nine had >20 cases (56%). Supplementary or robotic training modalities included simulation (9), animal models (6), surgical videos (7), and courses (2). Comparison of beginning and end of fellowship robotic/laparoscopic Milestone assessment (Summary Fig.) revealed scores of <3 in (10) 62% of fellow self-assessments and 10 (75%) of program director assessments. End of training Milestone scores >4 were seen in 12 (75%) of fellow self-assessment and eight (57%) of program director assessments.

DISCUSSION:

An improvement in robotic/laparoscopic Milestone scores by both fellow self-assessment and program director assessment was observed during the course of training; however, 43% of program directors rated their fellow below the graduation target of a Milestone score of 4.

CONCLUSION:

The best ways to teach minimally invasive surgery in fellowship training must be critically considered.

"What Program Directors Think" III: Results of the 2014/2015 Annual Surveys of the Association of Program Directors in Radiology (APDR).

[Rozenshtein A](#), [Heitkamp DE](#), [Muhammed TL](#), [Sclamberg JS](#), [Paladin AM](#), [Smith SE](#), [Nguyen JB](#), [Robbin M](#). *Acad Radiol*. 2016 Jul;23(7):861-9. doi: 10.1016/j.acra.2016.03.005. Epub 2016 Jun 8.

Abstract

RATIONALE AND OBJECTIVES:

The Association of Program Directors in Radiology regularly surveys its members regarding issues of importance to support radiology residency programs and their directors.

MATERIALS AND METHODS:

This is an observational cross-sectional study using two Web-based surveys posed to the Association of Program Directors in Radiology membership in the fall of 2014 (49 items) and the spring of 2015 (46 items) on the subjects of importance to the members, including the Accreditation Council on Graduate Medical Education Milestones, the Non-Interpretative Skills Curriculum, the American Board of Radiology Core Examination, the effect of the new resident testing and program accreditation paradigms on training outcomes, the 2015 Residency Match, the Interventional Radiology/Diagnostic Radiology (IR/DR) Residency, and Program Director (PD)/Program Coordinator resources.

RESULTS:

Responses were collected electronically, results were tallied using SurveyMonkey software, and qualitative responses were tabulated or summarized as comments. Findings were reported during the 63rd annual meeting of the Association of University Radiologists. The maximal response rate was 33% in the fall of 2014 and 36% in the spring of 2015.

CONCLUSIONS:

PDs believed that the radiology Milestones, now largely implemented, did not affect overall resident evaluation, was not reflective of resident experience, and actually made evaluation of residents more difficult. PDs also felt that although the American Board of Radiology oral examination had been a better test for clinical practice preparedness, their new residents knew at least as much as before. There was little evidence of recall reemergence. The radiology training community saw a drop in residency applicant quality as demonstrated by the United States Medical Licensing Examination scores and clinical rotation grades. Because the new IR/DR Residency positions were to be funded at the expense of the traditional DR positions, the majority of PDs expected a negative effect of the impending IR/DR match on their DR recruitment. PDs were in favor of a unified clinical radiology curriculum similar to the Radiological Society of North America online physics modules.

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A Survey of Ultrasound Milestone Incorporation Into Emergency Medicine Training Programs.

[Smalley CM, Dorey A, Thiessen M, Kendall JL. J Ultrasound Med. 2016 Jul;35\(7\):1517-21. doi: 10.7863/ultra.15.09012. Epub 2016 Jun 7.](#)

Abstract

OBJECTIVES:

With the introduction of the Emergency Medicine Milestone Project in 2013, residencies now assess emergency ultrasound (US) skills at regular intervals. However, it is unclear how programs are implementing the emergency US milestones and assessing competency. With the use of the milestone tool, a survey was distributed to emergency US educators to determine when programs are providing emergency US education, when residents are expected to attain competency, and whether the milestones reflect their expectations of trainees.

METHODS:

We conducted a prospective cross-sectional survey study distributed electronically to designated emergency US experts at 169 programs. Participants were queried on education and competency evaluation within the context of the milestones by designating a postgraduate year when the 5 milestone levels were taught and competency was expected. Survey findings were reported as percentages of total respondents from descriptive statistics.

RESULTS:

Responses were received from 53% of programs, and 99% were familiar with the milestones. Most programs provide level 1 (88%) and 2 (85%) instruction during postgraduate year 1. Most programs expect level 1 competency before residency (61%) and expect mastery of level 2 by the end of postgraduate year 1 (60%). Sixty-two percent believe the milestones do not accurately reflect their expectations, citing insufficient minimum scan numbers, lack of specificity, and unattainable level 5 requirements.

CONCLUSIONS:

There is substantial variability in the frequency and methods of competency evaluation using the emergency US milestones. However, most responders agree that residents should obtain level 2 competency by postgraduate year 1. Variation exists regarding what year and what skills define level 3 or greater competency.

Milestones for the Final Mile: Interspecialty Distinctions in Primary Palliative Care Skills Training.

[Harris JA](#), [Herrel LA](#), [Healy MA](#), [Wancata LM](#), [Perumalswami CR](#). *J Pain Symptom Manage*. 2016 Sep;52(3):345-352.e5. doi: 10.1016/j.jpainsymman.2016.03.007. Epub 2016 Jun 1.

CONTEXT:

Primary palliative care (PPC) skills are useful in a wide variety of medical and surgical specialties, and the expectations of PPC skill training are unknown across graduate medical education.

OBJECTIVES:

We characterized the variation and quality of PPC skills in residency outcomes-based Accreditation Council for Graduate Medical Education (ACGME) milestones.

METHODS:

We performed a content analysis with structured implicit review of 2015 ACGME milestone documents from 14 medical and surgical specialties chosen for their exposure to clinical situations requiring PPC. For each specialty milestone document, we characterized the variation and quality of PPC skills in residency outcomes-based ACGME milestones.

RESULTS:

We identified 959 occurrences of 29 palliative search terms within 14 specialty milestone documents. Within these milestone documents, implicit review characterized 104 milestones with direct saliency to PPC skills and 196 milestones with indirect saliency. Initial interrater agreement of the saliency rating among the primary reviewers was 89%. Specialty milestone documents varied widely in their incorporation of PPC skills within milestone documents. PPC milestones were most commonly found in milestone documents for Anesthesiology, Pediatrics, Urology, and Physical Medicine and Rehabilitation. PPC-relevant milestones were most commonly found in the Interpersonal and Communication Skills core competency with 108 (36%) relevant milestones classified under this core competency.

CONCLUSIONS:

Future revisions of specialty-specific ACGME milestone documents should focus on currently underrepresented, but important PPC skills.

Single Institution Studies

Critical Deficiency Ratings in Milestone Assessment: A Review and Case Study.

[Kinneer B](#), [Bensman R](#), [Held J](#), [O'Toole J](#), [Schauer D](#), [Warm E](#). *Acad Med*. 2017 Jun;92(6):820-826. doi: 10.1097/ACM.0000000000001383.

Abstract

PURPOSE:

The Accreditation Council for Graduate Medical Education (ACGME) requires programs to report learner progress using specialty-specific milestones. It is unclear how milestones can best identify critical deficiencies (CDs) in trainee performance. Specialties developed milestones independently of one another; not every specialty included CDs within milestones ratings. This study examined the proportion of ACGME milestone sets that include CD ratings, and describes one residency program's experiences using CD ratings in assessment.

METHOD:

The authors reviewed ACGME milestones for all 99 specialties in November 2015, determining which rating scales contained CDs. The authors also reviewed three years of data (July 2012-June 2015) from the University of Cincinnati Medical Center (UCMC) internal medicine residency assessment system based on observable practice activities mapped to ACGME milestones. Data were analyzed by postgraduate year, assessor type, rotation, academic year, and core competency. The Mantel-Haenszel chi-square test was used to test for changes over time.

RESULTS:

Specialties demonstrated heterogeneity in accounting for CDs in ACGME milestones, with 22% (22/99) of specialties having no language describing CDs in milestones assessment. Thirty-three percent (63/189) of UCMC internal medicine residents received at least one CD rating, with CDs accounting for 0.18% (668/364,728) of all assessment ratings. The authors identified CDs across multiple core competencies and rotations.

CONCLUSIONS:

Despite some specialties not accounting for CDs in milestone assessment, UCMC's experience demonstrates that a significant proportion of residents may be rated as having a CD during training. Identification of CDs may allow programs to develop remediation and improvement plans.

Rapid Web-Based Platform for Assessment of Orthopedic Surgery Patient Care Milestones: A 2-Year Validation.

[Gundle KR](#), [Mickelson DT](#), [Cherones A](#), [Black J](#), [Hanel DP](#). *J Surg Educ*. 2017 May 18. pii: S1931-7204(16)30242-2. doi: 10.1016/j.jsurg.2017.05.001. [Epub ahead of print]

Abstract

OBJECTIVE:

To determine the validity, feasibility, and responsiveness of a new web-based platform for rapid milestone-based evaluations of orthopedic surgery residents.

SETTING:

Single academic medical center, including a trauma center and pediatrics tertiary hospital.

PARTICIPANTS:

Forty residents (PG1-5) in an orthopedic residency program and their faculty evaluators.

METHODS:

Residents and faculty were trained and supported in the use of a novel trainee-initiated web-based evaluation system. Residents were encouraged to use the system to track progress on patient care subcompetencies. Two years of prospectively collected data were reviewed from residents at an academic program. The primary outcome was Spearman's rank correlation between postgraduate year (PGY) and competency level achieved as a measure of validity. Secondary outcomes assessed feasibility, resident self-evaluation versus faculty evaluation, the distributions among subcompetencies, and responsiveness over time.

RESULTS:

Between February 2014 and February 2016, 856 orthopedic surgery patient care subcompetency evaluations were completed (1.2 evaluations per day). Residents promptly requested feedback after a procedure (median = 0 days, interquartile range: 0-2), and faculty responded within 2 days in 51% (median = 2 days, interquartile range: 0-13). Primary outcome showed a correlation between PGY and competency level ($r = 0.78$, $p < 0.001$), with significant differences in competency among PGYs ($p < 0.001$ by Kruskal-Wallis rank sum test). Self-evaluations by residents substantially agreed with faculty-assigned competency level (weighted Cohen's $\kappa = 0.72$, $p < 0.001$). Resident classes beginning the study as PGY1, 2, and 3 separately demonstrated gains in competency over time (Spearman's rank correlation 0.39, 0.60, 0.59, respectively, each $p < 0.001$). There was significant variance in the number of evaluations submitted per subcompetency (median = 43, range: 6-113) and competency level assigned ($p < 0.01$).

CONCLUSIONS:

Rapid tracking of trainee competency with milestone-based evaluations in a learner-centered mobile platform demonstrated validity, feasibility, and responsiveness. Next Accreditation System-mandated data may be efficiently collected and used for trainee and program self-study.

Initial Comparison of Resident and Attending Milestones Evaluations in Plastic Surgery.

[Yao A, Massenborg BB, Silver L, Taub PJ. J Surg Educ. 2017 Mar 2. pii: S1931-7204\(17\)30068-5. doi: 10.1016/j.jsurg.2017.02.001. \[Epub ahead of print\]](#)

Abstract

BACKGROUND:

Graduate medical education has recently undergone a major archetypal shift toward competency-based evaluations of residents' performance. The implementation of the Milestones program by the Accreditation Council for Graduate Medical Education (ACGME) is a core component of the shift, designed to ensure uniformity in measuring residency knowledge using a series of specialty-specific achievements. This study evaluates the correlation between residents' self-evaluations and program directors' assessments of their performance.

METHODS:

The study population comprised 12 plastic surgery residents, ranging from postgraduate year 1 to postgraduate year 6, enrolled in an integrated residency program at a single institution.

RESULTS:

Overall, average attending scores were lower than average resident scores at all levels except postgraduate year 6. Correlation between resident and attending evaluations ranged from 0.417 to 0.957, with the correlation of average scores of Patient Care (0.854) and Medical Knowledge (0.816) Milestones significantly higher than those of professional skillsets (0.581). "Patient care, facial esthetics" was the Milestone with the lowest average scores from both groups. Residents scored themselves notably higher than their attendings' evaluations in Practice-based Learning and Improvement categories (+0.958) and notably lower in Medical Knowledge categories such as "Cosmetic Surgery, Trunk and Lower Extremities" (-0.375) and "Non-trauma hand" (-0.208). The total possible number of participants in this study was 12. The actual number of participants was 12 (100%).

CONCLUSIONS:

The remarkable range of correlations suggests that expectations for performance standards may vary widely between residents and program directors. Understanding gaps between expectations and performance is vital to inform current and future residents as the restructuring of the accreditation process continues.

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Milestones: a rapid assessment method for the Clinical Competency Committee.

[Nabors C](#), [Forman L](#), [Peterson SJ](#), [Gennarelli M](#), [Aronow WS](#), [DeLorenzo L](#), [Chandy D](#), [Ahn C](#), [Sule S](#), [Stallings GW](#), [Khera S](#), [Palaniswamy C](#), [Frishman WH](#). *Arch Med Sci*. 2017 Feb 1;13(1):201-209. doi: 10.5114/aoms.2016.64045. Epub 2016 Nov 29.

Abstract

INTRODUCTION:

Educational milestones are now used to assess the developmental progress of all U.S. graduate medical residents during training. Twice annually, each program's Clinical Competency Committee (CCC) makes these determinations and reports its findings to the Accreditation Council for Graduate Medical Education (ACGME). The ideal way to conduct the CCC is not known. After finding that deliberations reliant upon the new milestones were time intensive, our internal medicine residency program tested an approach designed to produce rapid but accurate assessments.

MATERIAL AND METHODS:

For this study, we modified our usual CCC process to include pre-meeting faculty ratings of resident milestones progress with in-meeting reconciliation of their ratings. Data were considered largely via standard report and presented in a pre-arranged pattern. Participants were surveyed regarding their perceptions of data management strategies and use of milestones. Reliability of competence assessments was estimated by comparing pre-/post-intervention class rank lists produced by individual committee members with a *master* class rank list produced by the collective CCC after full deliberation.

RESULTS:

Use of the study CCC approach reduced committee deliberation time from 25 min to 9 min per resident ($p < 0.001$). Committee members believed milestones improved their ability to identify and assess expected elements of competency development ($p = 0.026$). Individual committee member assessments of trainee progress agreed well with collective CCC assessments.

CONCLUSIONS:

Modification of the clinical competency process to include pre-meeting competence ratings with in-meeting reconciliation of these ratings led to shorter deliberation times, improved evaluator satisfaction and resulted in reliable milestone assessments.

Using the ACGME Milestones for Resident Self-Evaluation and Faculty Engagement.

[Meier AH, Gruessner A, Cooney RN. J Surg Educ. 2016 Nov - Dec;73\(6\):e150-e157. doi: 10.1016/j.jsurg.2016.09.001.](#)

Abstract

BACKGROUND:

Since July 2014 General Surgery residency programs have been required to use the Accreditation Council for Graduate Medical Education milestones twice annually to assess the progress of their trainees. We felt this change was a great opportunity to use this new evaluation tool for resident self-assessment and to furthermore engage the faculty in the educational efforts of the program.

METHODS:

We piloted the milestones with postgraduate year (PGY) II and IV residents during the 2013/2014 academic year to get faculty and residents acquainted with the instrument. In July 2014, we implemented the same protocol for all residents. Residents meet with their advisers quarterly. Two of these meetings are used for milestones assessment. The residents perform an independent self-evaluation and the adviser grades them independently. They discuss the evaluations focusing mainly on areas of greatest disagreement. The faculty member then presents the resident to the clinical competency committee (CCC) and the committee decides on the final scores and submits them to the Accreditation Council for Graduate Medical Education website. We stored all records anonymously in a MySQL database. We used Anova with Tukey post hoc analysis to evaluate differences between groups. We used intraclass correlation coefficients and Krippendorff's α to assess interrater reliability.

RESULTS:

We analyzed evaluations for 44 residents. We created scale scores across all Likert items for each evaluation. We compared score differences by PGY level and raters (self, adviser, and CCC). We found highly significant increases of scores between most PGY levels ($p < 0.05$). There were no significant score differences per PGY level between the raters. The interrater reliability for the total score and 6 competency domains was very high (ICC: 0.87-0.98 and α : 0.84-0.97). Even though this milestone evaluation process added additional work for residents and faculty we had very good participation (93.9% by residents and 92.9% by faculty) and feedback was generally positive.

CONCLUSION:

Even though implementation of the milestones has added additional work for general surgery residency programs, it has also opened opportunities to furthermore engage the residents in reflection and self-evaluation and to create additional venues for faculty to get involved with the educational process within the residency program. Using the adviser as the initial rater seems to correlate closely with the final CCC assessment. Self-evaluation by the resident is a requirement by the RRC and the milestones seem to be a good instrument to use for this purpose. Our early assessment suggests the milestones provide a useful instrument to track trainee progression through their residency.

Do Attending Surgeons and Residents See Eye To Eye? An Evaluation of the Accreditation Council For Graduate Medical Education Milestones in General Surgery Residency.

[Lyle B](#), [Borgert AJ](#), [Kallies KJ](#), [Jarman BT](#). [J Surg Educ](#). 2016 Nov - Dec;73(6):e54-e58. doi: 10.1016/j.jsurg.2016.07.004. Epub 2016 Aug 23.

Abstract

OBJECTIVE:

The Accreditation Council for Graduate Medical Education requires accredited general surgery residencies to implement competency-based developmental outcomes in resident evaluations. Overall, 16 milestones are evaluated by a clinical competency committee (CCC). The milestones span 8 domains of surgical practice and 6 Accreditation Council for Graduate Medical Education clinical competencies. The highest level suggests preparedness for independent practice. Our objective was to compare self-assessments and committee evaluations within the milestone framework.

STUDY DESIGN:

All residents underwent semiannual evaluations from 2013 to 2015. Residents independently completed a self-assessment using the milestones. The CCC completed the milestones document using resident evaluations and consensus opinion of committee members. Assessment differences were calculated for each evaluation. A negative value indicated that the residents evaluated themselves at a lower level than the committee. Major assessment disparities were defined as >0.5 on a 4-point scale.

SETTING:

An independent academic medical center.

PARTICIPANTS:

General surgery residents.

RESULTS:

Overall, 20 residents participated; 7 were female. In total, 5 (7%) evaluations had a mean overall assessment difference >0.5 , whereas 6 (8%) had a difference <-0.5 . Residents evaluated themselves lower than the committee with a median assessment difference of -0.06 [-0.25 to 0.16] ($p = 0.041$). Evaluations were similar across surgical domains. Negative self-evaluations were more common for medical knowledge (-0.25 [-0.25 to 0.25], $p = 0.025$). Female residents had 2% positive and 13% negative major assessment disparity rates versus 10% positive and 9% negative rates among male residents. Postgraduate year III residents had 12% positive and 4% negative major disparity rates; all other years had higher negative than positive rates.

CONCLUSIONS:

Surgery residents within our program demonstrated adequate self-awareness, with most self-evaluations falling within a half level of the CCC report. This self-awareness was consistent across surgical domains and most clinical competencies. Residents perceived a lower level of medical knowledge than the CCC.

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Subgroup analysis revealed interesting trends in the effects of sex, postgraduate year level, and academic year timing, which will take additional study to fully delineate.

Initial performance of a modified milestones global evaluation tool for semiannual evaluation of residents by faculty.

[Borman KR](#), [Augustine R](#), [Leibrandt T](#), [Pezzi CM](#), [Kukora JS](#). *J Surg Educ*. 2013 Nov-Dec;70(6):739-49. doi: 10.1016/j.jsurg.2013.08.004.

Abstract

OBJECTIVES:

To determine whether faculty could successfully evaluate residents using a competency-based modified Milestones global evaluation tool.

DESIGN:

A program's leadership team modified a draft Surgery Milestones Working Group summative global assessment instrument into a modified Milestones tool (MMT) for local use during faculty meetings devoted to semiannual resident review. Residents were scored on 15 items spanning all competencies using an 8-point graphic response scale; unstructured comments also were solicited. Arithmetic means were computed at the resident and postgraduate year cohort levels for items and competency item sets. Score ranges (highest minus lowest score) were calculated; variability was termed "low" (range <2.0 points), "moderate" (range = 2.0), or "high" (range >2.0). A subset of "low" was designated "small" (1.0-1.9). Trends were sought among item, competency, and total Milestones scores. MMT correlations with examination scores and multisource (360°) assessments were explored. The success of implementing MMT was judged using published criteria for educational assessment methods.

SETTING:

Fully accredited, independently sponsored residency.

PARTICIPANTS:

Program leaders and 22 faculty members (71% voluntary, mean 12y of experience).

RESULTS:

Twenty-six residents were assessed, yielding 7 to 13 evaluations for MMT per categorical resident and 3 to 6 per preliminary trainee. Scores spanned the entire response scale. All MMT evaluations included narrative comments. Individual resident score variability was low (96% within competencies and 92% across competencies). Subset analysis showed that small variations were common (35% within competencies and 54% across competencies). Postgraduate year cohort variability was higher (61% moderate or high within competencies and 50% across competencies). Cohort scores at the item, competency, and total score levels exhibited rising trajectories, suggesting MMT construct validity. MMT scores did not demonstrate concurrent validity, correlating poorly with other metrics. The MMT met multiple criteria for good assessment.

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CONCLUSIONS:

A modified Milestones global evaluation tool can be successfully adopted for semiannual assessments of resident performance by volunteer faculty members.

Using Milestones as Evaluation Metrics During an Emergency Medicine Clerkship.

[Quinn SM](#), [WorriLOW CC](#), [Jayant DA](#), [Bailey B](#), [Eustice E](#), [Kohlhepp J](#), [Rogers R](#), [Kane BG](#). J Emerg Med. 2016 Oct;51(4):426-431.

Abstract

BACKGROUND:

The Accreditation Council for Graduate Medical Education's (ACGME) Milestones presumes graduating medical students will enter residency proficient at Milestone level 1 for 23 skills. The Next Accreditation System now includes Milestones for each postgraduate specialty, and it is unlikely that schools will document every emergency medicine (EM) applicant's EM-specific skills in their performance evaluation.

OBJECTIVES:

The goals of this research were to determine if assessment of the Milestones was feasible during a medical student clerkship and examine the proportion of medical students performing at Milestone level 1.

METHODS:

This study was conducted at a center with Liaison Committee on Medical Education-approved medical training and a 4-year EM residency. Using traditional clerkship, we studied the feasibility of an ACGME EM Milestones-based clerkship assessment. Data led to redesign of the clerkship and its evaluation process, including all level 1 anchor(s) to add "occasionally" (>60%), "usually" (>80%), and "always" (100%) on a Likert scale to on-shift assessment forms.

RESULTS:

During the feasibility phase (2013-14), 75 students rotated through the clerkship; 55 evaluations were issued and 50 contained the Milestone summary. Eight deficiencies were noted in Milestone 12 and three in Milestone 14. After changes, 49 students rotated under the new evaluation rubric. Of 575 completed on-shift evaluations, 16 Milestone deficiencies were noted. Of 41 institutional evaluations issued, only one student had deficiencies noted, all of which pertained to patient care. All evaluations in this second cohort contained each student's Milestone proficiency.

CONCLUSIONS:

Assessment of the Milestones is feasible. Communication of ACGME EM Milestone proficiency may identify students who require early observation or remediation. The majority of students meet the anchors for the Milestones, suggesting that clerkship assessment with the ACGME EM Milestones does not adequately differentiate students.

Mapping Direct Observations From Objective Structured Clinical Examinations to the Milestones Across Specialties.

[Baker-Genaw K](#), [Kokas MS](#), [Ahsan SF](#), [Darnley-Fisch D](#), [Drake S](#), [Goyal N](#), [Inamdar K](#), [Moutzouros V](#), [Prabhakar D](#), [Rolland L](#), [Sangha R](#), [Shreve M](#), [Woodward A](#). *J Grad Med Educ*. 2016 Jul;8(3):429-34. doi: 10.4300/JGME-D-15-00385.1.

Abstract

BACKGROUND:

Little is known about residents' performance on the milestones at the institutional level. Our institution formed a work group to explore this using an institutional-level curriculum and residents' evaluation of the milestones.

OBJECTIVE:

We assessed whether beginner-level milestones for interpersonal and communication skills (ICS) related to observable behaviors in ICS-focused objective structured clinical examinations (OSCEs) for postgraduate year (PGY) 1 residents across specialties.

METHODS:

The work group compared ICS subcompetencies across 12 programs to identify common beginner-level physician-patient communication milestones. The selected ICS milestone sets were compared for common language with the ICS-OSCE assessment tool-the Kalamazoo Essential Elements of Communication Checklist-Adapted (KEECC-A). To assess whether OSCE scores related to ICS milestone scores, all PGY-1 residents from programs that were part of Next Accreditation System Phase 1 were identified; their OSCE scores from July 2013 to June 2014 and ICS subcompetency scores from December 2014 were compared.

RESULTS:

The milestones for 10 specialties and the transitional year had at least 1 ICS subcompetency that related to physician-patient communication. The language of the ICS beginner-level milestones appears similar to behaviors outlined in the KEECC-A. All 60 residents with complete data received at least a beginner-level ICS subcompetency score and at least a satisfactory score on all 3 OSCEs.

CONCLUSIONS:

The ICS-OSCE scores for PGY-1 residents appear to relate to beginner-level milestones for physician-patient communication across multiple specialties.

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How Effective are New Milestones Assessments at Demonstrating Resident Growth? 1 Year of Data.

[Goldman RH, Tuomala RE, Bengtson JM, Stagg AR. J Surg Educ. 2017 Jan - Feb;74\(1\):68-73. doi: 10.1016/j.jsurg.2016.06.009. Epub 2016 Jul 6.](#)

Abstract

OBJECTIVE:

Assessment tools that accrue data for the Accreditation Council for Graduate Medical Education Milestones must evaluate residents across multiple dimensions, including medical knowledge, procedural skills, teaching, and professionalism. Our objectives were to: (1) develop an assessment tool to evaluate resident performance in accordance with the Milestones and (2) review trends in resident achievements during the inaugural year of Milestone implementation.

DESIGN:

A novel venue and postgraduate year (PGY) specific assessment tool was built, tested, and implemented for both operating room and labor and delivery "venues." Resident development of competence and independence was captured over time. To account for variable rotation schedules, the year was divided into thirds and compared using two-tailed Fisher's exact test.

SETTING:

Brigham and Women's and Massachusetts General Hospitals, Boston MA.

PARTICIPANTS:

Faculty evaluators and obstetrics and gynecology residents.

RESULTS:

A total of 822 assessments of 44 residents were completed between 9/2014 and 6/2015. The percentage of labor and delivery tasks completed "independently" increased monotonically across the start of all years: 8.4% for PGY-1, 60.3% for PGY-2, 73.7% for PGY-3, and 87.5% for PGY-4. Assessments of PGY-1 residents demonstrated a significant shift toward "with minimal supervision" and "independent" for the management of normal labor ($p = 0.03$). PGY-3 residents demonstrated an increase in "able to be primary surgeon" in the operating room, from 36% of the time in the first 2/3 of the year, to 62.3% in the last 1/3 ($p < 0.01$).

CONCLUSION:

Assessment tools developed to assist with Milestone assignments capture the growth of residents over time and demonstrate quantifiable differences in achievements between PGY classes. These tools will allow for targeted teaching opportunities for both individual residents and residency programs.

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Entrusting Observable Practice Activities and Milestones Over the 36 Months of an Internal Medicine Residency.

[Warm EJ](#), [Held JD](#), [Hellmann M](#), [Kelleher M](#), [Kinnear B](#), [Lee C](#), [O'Toole JK](#), [Mathis B](#), [Mueller C](#), [Sall D](#), [Tolentino J](#), [Schauer DP](#). *Acad Med*. 2016 Oct;91(10):1398-1405.

Abstract

PURPOSE:

Competency-based medical education and milestone reporting have led to increased interest in work-based assessments using entrustment over time as an assessment framework. Little is known about data collected from these assessments during residency. This study describes the results of entrustment of discrete work-based skills over 36 months in the University of Cincinnati internal medicine (IM) residency program.

METHOD:

Attending physician and peer/allied health assessors provided entrustment ratings of resident performance on work-based observable practice activities (OPAs) mapped to Accreditation Council for Graduate Medicine Education/American Board of Internal Medicine reporting milestones for IM. These data were translated into milestones data and tracked longitudinally. The authors analyzed data from this new entrustment system's first 36 months (July 2012-June 2015).

RESULTS:

During the 36-month period, assessors made 364,728 milestone assessments (mapped from OPAs) of 189 residents. Residents received an annualized average of 83 assessment encounters, producing means of 3,987 milestone assessments and 4,325 words of narrative assessment. Mean entrustment ratings (range 1-5) from all assessors for all milestones rose from 2.46 for first-month residents to 3.92 for 36th-month residents ($r = 0.9252$, $P < .001$). Attending physicians' entrustment ratings were lower than peer/allied health assessors' ratings. Medical knowledge and patient care milestones were rated lower than professionalism and interpersonal and communication skills milestones.

CONCLUSIONS:

Entrustment of milestones appears to rise progressively over time, with differences by assessor type, competency, milestone, and resident. Further research is needed to elucidate the validity of these data in promotion, remediation, and reporting decisions.

A first look at the Accreditation Council for Graduate Medical Education anesthesiology milestones: implementation of self-evaluation in a large residency program.

[Ross FJ](#), [Metro DG](#), [Beaman ST](#), [Cain JG](#), [Dowdy MM](#), [Apfel A](#), [Jeong JH](#), [Ibinson JW](#). *J Clin Anesth.* 2016 Aug;32:17-24. doi: 10.1016/j.jclinane.2015.12.026. Epub 2016 Mar 22.

Abstract

STUDY OBJECTIVE:

The objective was to determine if there is a correlation between resident postgraduate year (PGY) of training and self-evaluation of performance using the Accreditation Council for Graduate Medical Education milestones.

DESIGN:

Survey.

SETTING:

Residency program at a large academic center.

PATIENTS:

Residents and Faculty Clinical Competency Committee (CCC).

INTERVENTIONS:

None.

MEASUREMENTS:

Resident and CCC milestone scores.

MAIN RESULTS:

Correlation coefficients for average score for each milestone vs PGY level ranged from 0.80 for receiving and giving feedback to 0.95 for anesthetic choice and conduct. All milestones showed a relatively linear relationship with PGY of training, and none were found to be consistently reached very late or very early in training. When examining variation across the scores for the individual residents, the distributions for PGY-2 and -3 appeared to be wider than those for PGY-1 and -4. The intraclass correlation coefficients ranged from 0.718 to 0.928.

CONCLUSIONS:

There was a remarkable degree of consistency in the relationship between level of training and resident self-assessment score for every milestone, as well as strong agreement between the resident and CCC faculty scores. Examination of the variance in the scores, when interpreted in light of our particular

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training program's characteristics, suggests that the milestones accurately reflect the progression in skill across the residency. In addition, given the concordance between the self-evaluation scores and the CCC faculty scores, self-evaluation may be a reasonable starting point as programs begin the daunting task of determining scores for each of the 25 milestones as part of the biannual evaluation process.

A pilot study of orthopaedic resident self-assessment using a milestones' survey just prior to milestones implementation.

[Bradley KE, Andolsek KM. *Int J Med Educ.* 2016 Jan 11;7:11-8. doi: 10.5116/ijme.5682.6dfd.](#)

Abstract

OBJECTIVE:

To pilot test if Orthopaedic Surgery residents could self-assess their performance using newly created milestones, as defined by the Accreditation Council on Graduate Medical Education.

METHODS:

In June 2012, an email was sent to Program Directors and administrative coordinators of the 154 accredited Orthopaedic Surgery Programs, asking them to send their residents a link to an online survey. The survey was adapted from the Orthopaedic Surgery Milestone Project. Completed surveys were aggregated in an anonymous, confidential database. SAS 9.3 was used to perform the analyses.

RESULTS:

Responses from 71 residents were analyzed. First and second year residents indicated through self-assessment that they had substantially achieved Level 1 and Level 2 milestones. Third year residents reported they had substantially achieved 30/41, and fourth year residents, all Level 3 milestones. Fifth year, graduating residents, reported they had substantially achieved 17 Level 4 milestones, and were extremely close on another 15. No milestone was rated at Level 5, the maximum possible. Earlier in training, Patient Care and Medical Knowledge milestones were rated lower than the milestones reflecting the other four competencies of Practice Based Learning and Improvement, Systems Based Practice, Professionalism, and Interpersonal Communication. The gap was closed by the fourth year.

CONCLUSIONS:

Residents were able to successfully self-assess using the 41 Orthopaedic Surgery milestones. Respondents' rate improved proficiency over time. Graduating residents report they have substantially, or close to substantially, achieved all Level 4 milestones. Milestone self-assessment may be a useful tool as one component of a program's overall performance assessment strategy.

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Operationalizing the internal medicine milestones-an early status report.

[Nabors C](#), [Peterson SJ](#), [Forman L](#), [Stallings GW](#), [Mumtaz A](#), [Sule S](#), [Shah T](#), [Aronow W](#), [Delorenzo L](#), [Chandy D](#), [Lehrman SG](#), [Frishman WH](#), [Holmboe E](#). *J Grad Med Educ*. 2013 Mar;5(1):130-7. doi: 10.4300/JGME-D-12-00130.1.

Abstract

BACKGROUND:

The internal medicine milestones were developed to advance outcomes-based residency training and will play an important role in the next accreditation system.

INNOVATION:

As an element of our program's participation in the internal medicine educational innovations project, we implemented a milestones-based evaluation process in our general medicine and pulmonary-critical care rotations on July 1, 2010.

MEASURES:

Outcomes assessed included survey-rated acceptability to participating faculty, residents, and clinical competency committee members.

RESULTS:

Faculty and residents agreed that the milestones promoted a common understanding of what knowledge, skills, and attitudes should be displayed at particular points in residents' professional development and enhanced evaluators' ability to provide specific performance feedback. Most residents and faculty members agreed that the milestones promoted fairness and uniformity in the evaluation process. Clinical competency committee members agreed the milestones improved the quality of information available for deliberations and resulted in more uniform promotion standards. Faculty rated the use of too many milestones per form/tool at a mean of 7.3 (where 1 was minimally problematic, and 10 was maximally problematic) and the potential for evaluator fatigue (mean, 8.2) as the most significant challenges to the use of milestones. Eight of 12 faculty members would recommend milestones in other programs; 4 were uncertain.

CONCLUSIONS:

Despite logistical challenges, educators and trainees found that milestones promoted a common understanding of what knowledge, skills and attitudes should be displayed at particular stages of training; permitted greater specificity in performance feedback; and enhanced uniformity and fairness in promotion decisions.

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A Milestone-Based Evaluation System-The Cure for Grade Inflation?

[Kuo LE](#), [Hoffman RL](#), [Morris JB](#), [Williams NN](#), [Malachesky M](#), [Huth LE](#), [Kelz RR](#). J Surg Educ. 2015 Nov-Dec;72(6):e218-25.

Abstract

PURPOSE:

Controversy exists over the optimal use of the Milestones in the process of resident evaluation and feedback. We sought to evaluate the performance of a Milestones-based feedback system in comparison to a traditional model.

METHODS:

The traditional evaluation system (TES) consisted of a generic 16-item survey using a 5-point Likert scale ranging from 1 to 5, and a free-text comments section. The Milestones-based evaluation system (MBES) was launched in July 2014, ranging from 0 to 4. Individual milestones were mapped to rotations based on resident educational goals by postgraduate year (PGY). The MBES consisted of a survey with a maximum of 7 items, followed by a free-text comment section. Within each evaluation system, an overall composite score was calculated for each categorical general surgical resident. To scale the 2 systems for comparison, TES scores were adjusted downward by 1 point. Descriptive statistics were performed. Univariate analysis was performed with the Wilcoxon signed-rank test. A test for trend across PGY was used for the MBES only.

RESULTS:

In the traditional system, the median score was 3.66 (range: 3.2-4.0). There was no meaningful difference in the median score by PGY. In the new system, the median score was 2.69 (range: 1.5-3.7, $p < 0.01$). The median score differed across PGY and increased by PGY of training ($p < 0.01$). There was an increase in differences between median scores by PGY.

CONCLUSIONS:

On using the milestones to facilitate faculty evaluation of resident knowledge and skill, there was a trend in increasing score by PGY of training. In the MBES, scores could be used to better discriminate resident skill and knowledge levels and resulted in improved differentiation in scoring by PGY. The use of the milestones as a basis for evaluation enabled the program to provide more meaningful feedback to residents and represents an improvement in surgical education.

[West J Emerg Med](#). 2015 Nov;16(6):931-5. doi: 10.5811/westjem.2015.8.27247. Epub 2015 Nov 12.

Emergency Medicine Residents Consistently Rate Themselves Higher than Attending Assessments on ACGME Milestones.

[Goldflam K, Bod J, Della-Giustina D, Tsyulnik A. West J Emerg Med. 2015 Nov;16\(6\):931-5. doi: 10.5811/westjem.2015.8.27247. Epub 2015 Nov 12.](#)

Abstract

INTRODUCTION:

In 2012 the Accreditation Council for Graduate Medical Education (ACGME) introduced the Next Accreditation System (NAS), which implemented milestones to assess the competency of residents and fellows. While attending evaluation and feedback is crucial for resident development, perhaps equally important is a resident's self-assessment. If a resident does not accurately self-assess, clinical and professional progress may be compromised. The objective of our study was to compare emergency medicine (EM) resident milestone evaluation by EM faculty with the same resident's self-assessment.

METHODS:

This is an observational, cross-sectional study that was performed at an academic, four-year EM residency program. Twenty-five randomly chosen residents completed milestone self-assessment using eight ACGME sub-competencies deemed by residency leadership as representative of core EM principles. These residents were also evaluated by 20 faculty members. The milestone levels were evaluated on a nine-point scale. We calculated the average difference between resident self-ratings and faculty ratings, and used sample t-tests to determine statistical significance of the difference in scores.

RESULTS:

Eighteen residents evaluated themselves. Each resident was assessed by an average of 16 attendings (min=10, max=20). Residents gave themselves statistically significant higher milestone ratings than attendings did for each sub-competency examined ($p < 0.0001$).

CONCLUSION:

Residents over-estimated their abilities in every sub-competency assessed. This underscores the importance of feedback and assessment transparency. More attention needs to be paid to methods by which residency leadership can make residents' self-perception of their clinical ability more congruent with that of their teachers and evaluators. The major limitation of our study is small sample size of both residents and attendings.

Use of Emergency Medicine Milestones as Items on End-of-Shift Evaluations Results in Overestimates of Residents' Proficiency Level.

[Dehon E](#), [Jones J](#), [Puskarich M](#), [Sandifer JP](#), [Sikes K](#). [J Grad Med Educ](#). 2015 Jun;7(2):192-6. doi: 10.4300/JGME-D-14-00438.1.

Abstract

BACKGROUND:

The emergency medicine milestones were developed to provide more objective resident assessment than current methods. However, little is known about the best practices for applying the milestones in resident assessment.

OBJECTIVE:

We examined the utility of end-of-shift evaluations (ESEs) constructed using the milestones in resident assessment.

METHODS:

We developed 14 daily ESEs, each of which included 9 or 10 emergency medicine milestones. Postgraduate year (PGY)-1 and PGY-2 residents were assessed on milestone levels 1 through 3; PGY-3 and PGY-4 residents were assessed on levels 3 through 5. Each milestone was rated on a nominal scale (yes, no, or not applicable). The Clinical Competency Committee combined the ESE data with data from other assessments to determine each resident's proficiency level for the emergency medicine subcompetencies. We used descriptive statistics to summarize resident ESEs and milestone levels. We analyzed differences in ESE score across PGY levels using t tests and analyses of variance.

RESULTS:

Faculty completed 763 ESEs on 33 residents with a range of 2 to 54 (median=22) ESEs per resident. Faculty rarely (8%, 372 of 4633) rated a resident as not achieving a milestone on the ESEs. Analyses of variance revealed that ESE scores on level 3 milestones did not differ significantly by PGY level. There was poor agreement between ESE scores and Clinical Competency Committee ratings.

CONCLUSIONS:

The ESEs constructed using the milestones resulted in grade or milestone inflation. Our results do not support using milestones as a stand-alone assessment tool.

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Development and evaluation of standardized narrative cases depicting the general surgery professionalism milestones.

[Rawlings A](#), [Knox AD](#), [Park YS](#), [Reddy S](#), [Williams SR](#), [Issa N](#), [Jameel A](#), [Tekian A](#). *Acad Med.* 2015 Aug;90(8):1109-15. doi: 10.1097/ACM.0000000000000739.

PURPOSE:

Residency programs now are required to use educational milestones, which has led to the need for new methods of assessment. The literature suggests that narrative cases are a promising tool to track residents' progress. This study demonstrates the process for developing and evaluating narrative cases representing the five levels of the professionalism milestones.

METHOD:

In 2013, the authors identified 28 behaviors in the Accreditation Council for Graduate Medical Education general surgery professionalism milestones. They modified previously published narrative cases to fit these behaviors. To evaluate the quality of these cases, the authors developed a 28-item, five-point scale instrument, which 29 interdisciplinary faculty completed. The authors compared the faculty ratings by narrative case and specialty with the authors' initial rankings of the cases by milestone level. They used t tests and analysis of variance to compare mean scores across specialties.

RESULTS:

The authors developed 10 narrative cases, 2 for each of the 5 milestone levels. Each case contained at least 20 of the 28 behaviors identified in the milestones. Mean faculty ratings matched the milestone levels. Reliability was good (G coefficient = 0.86, phi coefficient = 0.85), indicating consistency in raters' ability to determine the proper milestone level for each case.

CONCLUSIONS:

The authors demonstrate a process for using specialty-specific milestones to develop narrative cases that map to a spectrum of professionalism behaviors. This process can be applied to other competencies and specialties to facilitate faculty awareness of resident performance descriptors and provide a frame of reference for milestones assessment.

Impact on house staff evaluation scores when changing from a Dreyfus- to a Milestone-based evaluation model: one internal medicine residency program's findings.

[Friedman KA](#), [Balwan S](#), [Cacace F](#), [Katona K](#), [Sunday S](#), [Chaudhry S](#). [Med Educ Online](#). 2014 Nov 24;19:25185. doi: 10.3402/meo.v19.25185. eCollection 2014.

Abstract

PURPOSE:

As graduate medical education (GME) moves into the Next Accreditation System (NAS), programs must take a critical look at their current models of evaluation and assess how well they align with reporting outcomes. Our objective was to assess the impact on house staff evaluation scores when transitioning from a Dreyfus-based model of evaluation to a Milestone-based model of evaluation. Milestones are a key component of the NAS.

METHOD:

We analyzed all end of rotation evaluations of house staff completed by faculty for academic years 2010-2011 (pre-Dreyfus model) and 2011-2012 (post-Milestone model) in one large university-based internal medicine residency training program. Main measures included change in PGY-level average score; slope, range, and separation of average scores across all six Accreditation Council for Graduate Medical Education (ACGME) competencies.

RESULTS:

Transitioning from a Dreyfus-based model to a Milestone-based model resulted in a larger separation in the scores between our three post-graduate year classes, a steeper progression of scores in the PGY-1 class, a wider use of the 5-point scale on our global end of rotation evaluation form, and a downward shift in the PGY-1 scores and an upward shift in the PGY-3 scores.

CONCLUSIONS:

For faculty trained in both models of assessment, the Milestone-based model had greater discriminatory ability as evidenced by the larger separation in the scores for all the classes, in particular the PGY-1 class.

Clinical Assessment and Management Examination--Outpatient (CAMEO): its validity and use in a surgical milestones paradigm.

[Wilson AB](#), [Choi JN](#), [Torbeck LJ](#), [Mellinger JD](#), [Dunnington GL](#), [Williams RG](#). *J Surg Educ*. 2015 Jan-Feb;72(1):33-40. doi: 10.1016/j.jsurg.2014.06.010. Epub 2014 Jul 24.

Abstract

OBJECTIVES:

Clinical Assessment and Management Examination--Outpatient (CAMEO) is a metric for evaluating the clinical performance of surgery residents. The aim of this study was to investigate the measurement characteristics of CAMEO and propose how it might be used as an evaluation tool within the general surgery milestones project.

DESIGN:

A total of 117 CAMEO evaluations were gathered and used for analysis. Internal consistency reliability was estimated, and item characteristics were explored. A Kruskal-Wallis procedure was performed to discern how well the instrument discriminated between training levels. An exploratory factor analysis was also conducted to understand the dimensionality of the evaluation.

SETTING:

CAMEO evaluations were collected from 2 departments of surgery geographically located in the Midwestern United States. Combined, the participating academic institutions graduate approximately 18 general surgery residents per year.

PARTICIPANTS:

In this retrospective data analysis, the number of evaluations per resident ranged from 1 to 7, and evaluations were collected from 2006 to 2013. For the purpose of data analysis, residents were classified as interns (postgraduate year 1 [PGY1]), juniors (PGY2-3), or seniors (PGY4-5).

RESULTS:

CAMEO scores were found to have high internal consistency (Cronbach's $\alpha = 0.96$), and all items were highly correlated (≥ 0.86) to composite CAMEO scores. Scores discriminated between senior residents (PGY4-5) and lower level residents (PGY1-3). Per an exploratory factor analysis, CAMEO was revealed to measure a single dimension of "clinical competence."

CONCLUSIONS:

The findings of this research aligned with related literature and verified that CAMEO scores have desirable measurement properties, making CAMEO an attractive resource for evaluating the clinical performance of surgery residents.

Evaluating Surgical Residents Quickly and Easily Against the Milestones Using Electronic Formative Feedback.

[Hartranft TH](#), [Yandle K](#), [Graham T](#), [Holden C](#), [Chambers LW](#). *J Surg Educ*. 2017 Mar - Apr;74(2):237-242. doi: 10.1016/j.jsurg.2016.09.006. Epub 2016 Oct 13.

Abstract

OBJECTIVE:

This study was conducted to assess the effectiveness of a newly implemented electronic web-based review system created at our institution for evaluating resident performance relative to established milestones.

DESIGN:

Retrospective review of data collected from a survey of general surgery faculty and residents.

SETTING:

Tertiary care teaching hospital system and independent academic medical center.

PARTICIPANTS:

A total of 12 general surgery faculty and 17 general surgery residents participated in this study. The survey queried the level of satisfaction before and after the adoption of QuickNotes using several statements scored on a 5-point scale, with 1 being the lowest rating as "not satisfied," and 5 being the highest rating as "completely satisfied."

RESULTS:

The weighted average improvements from pre- to post-QuickNotes implementation for the faculty responding to the survey ranged from 10% to 40%; weighted average improvements for the residents responding to the survey ranged from 5% to 73%. For the survey of faculty, both sets of weighted averages tended to be higher than the weighted average for the resident's survey responses. The highest rated topic was the faculty's level of satisfaction with the "frequency to provide feedback" with a post-QuickNotes implementation weighted average of 4.25, closely followed by the residents' level of satisfaction with the "evaluation includes positive feedback" with a post-QuickNotes implementation weighted average of 4.24. The most notable increases in weighted averages from preimplementation to postimplementation were noted for "overall satisfaction" (20% increase for faculty, 37% for residents), "reflects actual criteria that matter" (36% increase for faculty, 73% for residents), faculty "opportunity for follow-up" (increase of 40%), resident "reflects overall trends" (increase of 37%), and resident "provides new information about my performance" (increase of 37%).

CONCLUSIONS:

Our institutional adoption of QuickNotes into the resident evaluation process has been associated with an overall increased level of satisfaction in the evaluation process by both faculty and residents. The design of QuickNotes facilitates its integration into the resident training environment, as it is web based, easy to use, and has no additional cost over the standard New Innovations subscription. Although it is designed to capture snapshots of trainee behavior and performance, monthly reports through QuickNotes can be

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used effectively in conjunction with the more traditional end-of-rotation evaluations to show trends, identify areas of strength that should be reinforced, demonstrate areas needing improvement, allow for a more tailored individual education plan to be developed, and permit a more accurate determination of milestone progression.

Medical School Milestone Studies

Competency milestones for medical students: Design, implementation, and analysis at one medical school.

[Lomis KD](#), [Russell RG](#), [Davidson MA](#), [Fleming AE](#), [Pettepher CC](#), [Cutrer WB](#), [Fleming GM](#), [Miller BM](#). *Med Teach*. 2017 May;39(5):494-504. doi: 10.1080/0142159X.2017.1299924. Epub 2017 Mar 10.

Abstract

Competency-based assessment seeks to align measures of performance directly with desired learning outcomes based upon the needs of patients and the healthcare system. Recognizing that assessment methods profoundly influence student motivation and effort, it is critical to measure all desired aspects of performance throughout an individual's medical training. The Accreditation Council for Graduate Medical Education (ACGME) defined domains of competency for residency; the subsequent Milestones Project seeks to describe each learner's progress toward competence within each domain. Because the various clinical disciplines defined unique competencies and milestones within each domain, it is difficult for undergraduate medical education to adopt existing GME milestones language. This paper outlines the process undertaken by one medical school to design, implement and improve competency milestones for medical students. A team of assessment experts developed milestones for a set of focus competencies; these have now been monitored in medical students over two years. A unique digital dashboard enables individual, aggregate and longitudinal views of student progress by domain. Validation and continuous quality improvement cycles are based upon expert review, user feedback, and analysis of variation between students and between assessors. Experience to date indicates that milestone-based assessment has significant potential to guide the development of medical students.

Using the ACMGE Milestones as a Handover Tool From Medical School to Surgery Residency.

[Wancata LM](#), [Morgan H](#), [Sandhu G](#), [Santen S](#), [Hughes DT](#). *J Surg Educ*. 2017 May - Jun;74(3):519-529. doi: 10.1016/j.jsurg.2016.10.016. Epub 2016 Nov 28.

Abstract

OBJECTIVE:

To map current medical school assessments for graduating students to the Accreditation Council for Graduate Medical Education (ACGME) milestones in general surgery, and to pass forward individual performance metrics on level 1 milestones to receiving residency programs.

DESIGN:

The study included 20 senior medical students who were accepted into surgery internship positions. Data from medical school performance assessments from the third-year surgery clerkship, fourth-year surgery rotations, fourth-year surgery boot camp, Clinical Competency Assessment Examination, and United States Medical Licensing Examination (USMLE) Step 1 and 2 examinations were used to map each student's competency assessments to the General Surgery Milestones based on a scoring system created and validated by independent assessors. This Milestones Assessment was then provided to each student's receiving program director.

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SETTING:

The study was conducted at the University of Michigan Medical School, in Ann Arbor, Michigan.

PARTICIPANTS:

Fourth-year medical students entering into surgical internship.

RESULTS:

Of 16 Accreditation Council for Graduate Medical Education (ACGME) General Surgery Milestones subcompetencies, 12 were able to be evaluated with current medical school assessments. Of the 20 students, 11 met criteria for all the level 1 milestones and 9 needed improvement in at least 1 domain.

Using Transitional Year Milestones to Assess Graduating Medical Students' Skills During a Capstone Course.

[Clay AS](#), [Andolsek K](#), [Grochowski CO](#), [Engle DL](#), [Chudgar SM](#). *J Grad Med Educ*. 2015 Dec;7(4):658-62. doi: 10.4300/JGME-D-14-00569.1.

Abstract

BACKGROUND:

Undergraduate medical education (UME) follows the lead of graduate medical education (GME) in moving to competency-based assessment. The means for and the timing of competency-based assessments in UME are unclear.

OBJECTIVE:

We explored the feasibility of using the Accreditation Council for Graduate Medical Education Transitional Year (TY) Milestones to assess student performance during a mandatory, fourth-year capstone course.

METHODS:

Our single institution, observational study involved 99 medical students who completed the course in the spring of 2014. Students' skills were assessed by self, peer, and faculty assessment for 6 existing course activities using the TY Milestones. Evaluation completion rates and mean scores were calculated.

RESULTS:

Students' mean milestone levels ranged between 2.2 and 3.6 (on a 5-level scoring rubric). Level 3 is the performance expected at the completion of a TY. Students performed highest in breaking bad news and developing a quality improvement project, and lowest in developing a learning plan, working in interdisciplinary teams, and stabilizing acutely ill patients. Evaluation completion rates were low for some evaluations, and precluded use of the data for assessing student performance in the capstone course. Students were less likely to complete separate online evaluations. Faculty were less likely to complete evaluations when activities did not include dedicated time for evaluations.

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CONCLUSIONS:

Assessment of student competence on 9 TY Milestones during a capstone course was useful, but achieving acceptable evaluation completion rates was challenging. Modifications are necessary if milestone scores from a capstone are intended to be used as a handoff between UME and GME.

Reporting Achievement of Medical Student Milestones to Residency Program Directors: An Educational Handover.

[Sozener CB](#), [Lypson ML](#), [House JB](#), [Hopson LR](#), [Dooley-Hash SL](#), [Hauff S](#), [Eddy M](#), [Fischer JP](#), [Santen SA](#). *Acad Med*. 2016 May;91(5):676-84. doi: 10.1097/ACM.0000000000000953.

Abstract

PROBLEM:

Competency-based education, including assessment of specialty-specific milestones, has become the dominant medical education paradigm; however, how to determine baseline competency of entering interns is unclear-as is to whom this responsibility falls. Medical schools should take responsibility for providing residency programs with accurate, competency-based assessments of their graduates.

APPROACH:

A University of Michigan ad hoc committee developed (spring 2013) a post-Match, milestone-based medical student performance evaluation for seven students matched into emergency medicine (EM) residencies. The committee determined EM milestone levels for each student based on assessments from the EM clerkship, end-of-third-year multistation standardized patient exam, EM boot camp elective, and other medical school data.

OUTCOMES:

In this feasibility study, the committee assessed nearly all 23 EM milestones for all seven graduates, shared these performance evaluations with the program director (PD) where each student matched, and subsequently surveyed the PDs regarding this pilot. Of the five responding PDs, none reported using the traditional medical student performance evaluation to customize training, four (80%) indicated that the proposed assessment provided novel information, and 100% answered that the assessment would be useful for all incoming trainees.

NEXT STEPS:

An EM milestone-based, post-Match assessment that uses existing assessment data is feasible and may be effective for communicating competency-based information about medical school graduates to receiving residency programs. Next steps include further aligning assessments with competencies, determining the benefit of such an assessment for other specialties, and articulating the national need for an effective educational handover tool between undergraduate and graduate medical education institutions.

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Programmatic assessment of level 1 milestones in incoming interns.

[Hauff SR](#), [Hopson LR](#), [Losman E](#), [Perry MA](#), [Lypson ML](#), [Fischer J](#), [Santen SA](#). [Acad Emerg Med](#). 2014 Jun;21(6):694-8. doi: 10.1111/acem.12393.

Abstract

OBJECTIVES:

With the Accreditation Council for Graduate Medical Education (ACGME) Next Accreditation System, emergency medicine (EM) residency programs will be required to report residents' progress through the EM milestones. The milestones include five progressively advancing skill levels, with Level 1 defining the skill set of a medical school graduate and Level 5, that of an attending physician. The ACGME stresses that multiple forms of assessment should be used to ensure capture of the multifaceted competencies. The objective of this study was to determine the feasibility and results of programmatic assessment of Level 1 milestones using multisource assessments for incoming EM interns in July.

METHODS:

The study population was interns starting in 2012 and 2013. Interns' Level 1 milestone assessment was done with four distinct methods: 1) the postgraduate orientation assessment (POA) by the Graduate Medical Education Office for all incoming interns (this multistation examination covers nine of the EM milestones and includes standardized patient cases, task completion, and computer-based stations); 2) direct observation of patient encounters by core faculty using a milestones-based clinical skills competency checklist; 3) the global monthly assessment at the end of the intern orientation month that was updated to reflect the EM milestones; and 4) faculty assessment during procedural labs. These occurred during the July orientation month that included the POA, clinical shifts, didactic sessions, and procedure labs.

RESULTS:

In the POA, interns were competent in 48% to 93% of the milestones assessed. Overall, competency was 70% to 80%, with low scores noted in aseptic technique (patient care Milestone 13 [PC13]) and written and verbal hand-off (interpersonal communications skills [ICS]2). In overall communication, 70% of interns demonstrated competency. In excess of 80% demonstrated competency in critical values interpretation (PC3), informed consent (PC9), pain assessment (PC11), and geriatric functional assessment (PC3). On direct observation, almost all Level 1 milestones were achieved (93% to 100%); however, only 78% of interns achieved competency in pharmacotherapy (PC5). On global monthly evaluations, all interns met Level 1 milestones.

CONCLUSIONS:

A multisource assessment of EM milestones is feasible and useful to determine Level 1 milestones achievement for incoming interns. A structured assessment program, used in conjunction with more traditional forms of evaluation such as global monthly evaluations and direct observation, is useful for identifying deficits in new trainees and may be able inform the creation of early intervention programs.

International Studies

Does one size fit all? Examining the Application of Neurosurgery Residency Milestones Developed in the USA to a Taiwanese Culture.

[Lee CY](#), [Lai HY](#), [Lee CH](#), [Lee ST](#). [World Neurosurg](#). 2017 Apr 28. pii: S1878-8750(17)30637-X. doi: 10.1016/j.wneu.2017.04.129. [Epub ahead of print]

Abstract

BACKGROUND:

The Milestone Project was launched in 2009, charging specialties to develop specific educational accomplishments required to establish clinical competency. The milestone assessment method was first introduced to Taiwan in 2013 and prior to applying milestone assessments to our medical education system, the validity and reliability of these questionnaires needed to be evaluated.

METHOD:

Twenty neurosurgical faculty members representing 3 clinical divisions and all 4 branch institutes completed milestone questionnaires for 26 residents semiannually resulting in 435 resident assessments being collected and analyzed.

RESULTS:

Cronbach's α , KR-20, and Kendall's W were used to show acceptable reliability and validity. Rater consistencies for non-skilled parts found that rater consistency progressively improved over time. Not all raters were able to assess the residents for the skilled parts resulting in non-assessable rates ranging from 9.5% to 89.4%. For both non-skilled and skilled items, milestone level as assessed by the staff improved as the resident progressed from R3 to R6 in the residency program and showed that the milestone achievement level for an R3 was lower than that of an R6.

CONCLUSION:

Milestone assessments have high reliability and may be a helpful assessment tool. Although milestone assessment can provide thorough feedback concerning performance and the content of the training program, they may not perfectly suit all residency-training programs, especially in different countries or different cultures. modifications should be done before applying milestones to different areas so that the results can truly reflect the progress and condition of the training and learning process.

Other Milestone-related Studies

Implementation of a Needs-Based, Online Feedback Tool for Anesthesia Residents With Subsequent Mapping of the Feedback to the ACGME Milestones.

[Tanaka P](#), [Bereknyei Merrell S](#), [Walker K](#), [Zocca J](#), [Scotto L](#), [Bogetz AL](#), [Macario A](#). *Anesth Analg*. 2017 Feb;124(2):627-635. doi: 10.1213/ANE.0000000000001647.

BACKGROUND:

Optimizing feedback that residents receive from faculty is important for learning. The goals of this study were to (1) conduct focus groups of anesthesia residents to define what constitutes optimal feedback; (2) develop, test, and implement a web-based feedback tool; and (3) then map the contents of the written comments collected on the feedback tool to the Accreditation Council for Graduate Medical Education (ACGME) anesthesiology milestones.

METHODS:

All 72 anesthesia residents in the program were invited to participate in 1 of 5 focus groups scheduled over a 2-month period. Thirty-seven (51%) participated in the focus groups and completed a written survey on previous feedback experiences. On the basis of the focus group input, an initial online feedback tool was pilot-tested with 20 residents and 62 feedback sessions, and then a final feedback tool was deployed to the entire residency to facilitate the feedback process. The completed feedback written entries were mapped onto the 25 ACGME anesthesiology milestones.

RESULTS:

Focus groups revealed 3 major barriers to good feedback: (1) too late such as, for example, at the end of month-long clinical rotations, which was not useful because the feedback was delayed; (2) too general and not specific enough to immediately remedy behavior; and (3) too many in that the large number of evaluations that existed that were unhelpful such as those with unclear behavioral anchors compromised the overall feedback culture. Thirty residents (42% of 72 residents in the program) used the final online feedback tool with 121 feedback sessions with 61 attendings on 15 rotations at 3 hospital sites. The number of feedback tool uses per resident averaged 4.03 (standard deviation 5.08, median 2, range 1-21, 25th-75th % quartile 1-4). Feedback tool uses per faculty averaged 1.98 (standard deviation 3.2, median 1, range 1-25, 25th-75th % quartile 1-2). For the feedback question item "specific learning objective demonstrated well by the resident," this yielded 296 milestone-specific responses. The majority (71.3%) were related to the patient care competency, most commonly the anesthetic plan and conduct (35.8%) and airway management (11.1%) milestones; 10.5% were related to the interpersonal and communication skills competency, most commonly the milestones communication with other professionals (4.4%) or with patients and families (4.4%); and 8.4% were related to the practice-based learning and improvement competency, most commonly self-directed learning (6.1%). For the feedback tool item "specific learning objective that resident may improve," 67.0% were related to patient care, most commonly anesthetic plan and conduct (33.5%) followed by use/interpretation of monitoring and equipment (8.5%) and airway management (8.5%); 10.2% were related to practice-based learning and improvement, most commonly self-directed learning (6.8%); and 9.7% were related to the systems-based practice competency.

CONCLUSIONS:

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Resident focus groups recommended that feedback be timely and specific and be structured around a tool. A customized online feedback tool was developed and implemented. Mapping of the free-text feedback comments may assist in assessing milestones. Use of the feedback tool was lower than expected, which may indicate that it is just 1 of many implementation steps required for behavioral and culture change to support a learning environment with frequent and useful feedback.

Shifting Approaches for Evaluation of Resident Performance: From Competencies to Milestones. (Commentary)

[Logio LS. JAMA.](#) 2016 Dec 6;316(21):2197-2199. doi: 10.1001/jama.2016.16399.

-no abstract available.